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Vol. LXIII No. 2 February 1924

A Year in Lhasa . . . . . Sir Charles Bell 89
The Influence of Nature on Japanese Character . . . . . Rev. Walter Weston 106
Contributions to the Physiography and Geology of the South-East Coast of British North Borneo . . . . . Max Reinhard 121
The Tides and the Work of the Tidal Institute, Liverpool . . . . . Dr. A. T. Doodson 134
The Geodetic Evidence for the supposed Westerly Drift of Greenland . . . . . Colonel Sir Charles Close 147
The Damascus-Baghdad Motor Route . . . . . E. H. Keeling 150
Place-Names in the Irish Free State 153
Reviews The Monthly Record of the Society Obituary Meetings
Contents v
Society Notices vi

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The Geographical Journal

Vol. LXIII No. 2 February 1924

A YEAR IN LHASA

Sir Charles Bell, K.C.I.E., C.M.G.

Read at the Meeting of the Society, 3 December 1923.

VISITORS to Tibet, and even those who stay there a long time, do not as a rule come into touch with the leading people of the country. But during the nineteen years out of my public service which I spent partly on the borderland between India and Tibet and partly in Tibet itself, it was my good fortune to be brought into close contact with the Dalai Lama and the leading men of the country on several occasions. In 1910 the Chinese invaded Tibet and occupied Lhasa. The Dalai Lama, with the majority of the members of his Government, fled to India and remained there for over two years. Being, among other duties, in charge of our political relations with Tibet, I saw His Holiness and his ministers at short intervals during the whole of this period. For they were naturally distressed at the invasion and occupation of their country, and any little kindness or hospitality that one could show was likely both to ease their minds and to react favourably on the relations between Tibet and India. They returned to Lhasa in 1912, after their soldiers had expelled the Chinese troops from Central Tibet, and from that time onwards I received constant invitations from His Holiness and the Tibetan Government to visit them at Lhasa.

The Prime Minister of Tibet revisited India in 1913 in connection with a diplomatic conference, and remained there for eight or nine months, during which time our friendship was further strengthened.

In October 1920 our Government deputed me on a diplomatic mission to Lhasa. I left the Chumbi Valley on November 1, arrived in Lhasa on the 17th, and remained for nearly a year—longer than any white man had been there for over a hundred and fifty years. And as the invited guest of the Dalai Lama and the Tibetan Government I was shown pretty well everything that I wished to see. I quote these biographical details merely to show that I enjoyed facilities for studying the life in Lhasa, a few features of which I propose to show you this evening.

And how interesting that life is! For—more than in most countries—

the social, political, and religious activities of Tibet centre in their capital. Here the leading men and women foregather, here are the members of the Government and the large monasteries, here dwells the Vice-Regent of Buddha in the person of the Dalai Lama.

The road from Sikkim to Lhasa is by now fairly well known. The first portion of it is especially familiar to you from the admirable photographs of the Mount Everest Expedition. We will therefore pass over it quickly. You experience a great change as you pass from lower Sikkim, with its warm wet climate, its large proportion of Gurkhas, and its semi-Indianized bazaars, across one of the passes into the Chumbi Valley. Here we are in a valley the lower portion of which is 9000 to 10,000 feet above sea-level and possesses a good climate, temperate in heat and cold, temperate in rainfall. The standard of prosperity, shown among other ways by the houses of the people, is high compared with that of India.

We go up this valley to Phari, which is known to you from the Mount Everest pictures, and the Tang La, or "Clear Pass," where we cross the main axis of the Himalaya and are at once in the cold dry climate which Tibet knows so well how to provide. Here our road diverges from that which was subsequently followed by the Mount Everest party. They proceeded westward to their highly successful attack on the great mountain, an attack which we all hope may attain a greater, and even a complete, success next year. Our road lay to the north-east. Crossing "The Plain of the Three Sisters" at an elevation slightly lower than the summit of Mont Blanc, we passed along the "Otter Lake" and other plains and valleys to the town of Gyantse, whose name denotes "The Peak of Victory." This, one of the largest towns in Tibet, was opened as a mart for British and Indian trade by the treaty which our late President Sir Francis Younghusband concluded at Lhasa in 1904.

From Gyantse onwards one of the two officials, jointly in charge of the Gyantse district, accompanied us. He had been deputed by the Tibetan Government for this purpose, and served also to show the people that we were going to Lhasa on the Dalai Lama's invitation.

The road crosses the Karō La, 40 miles from Gyantse, at an elevation of between 16,000 and 17,000 feet, descends to "The Lake of the Upland Pastures" (*Yamdrok Tso* in Tibetan), along which it passes for some 27 miles. A few miles off our road was the monastery of Samding, the home of Dorje Pamo, the highest lady in Tibet. For she ranks as an Incarnation of a Buddhist deity, the only female Incarnation in Tibet, and possesses the peculiar power of turning herself and the fifty-nine other inmates, who are monks, not nuns, into pigs. I was, I think, the first white man to visit her at her own monastery. We had a long conversation, and she regaled my party and myself with an excellent lunch. It is not every day that one has the opportunity of lunching with a goddess! She was twenty-four years of age, with a pensive mien

and an air of quiet dignity. We exchanged presents, in accordance with Tibetan custom. I sent her a watch, for she told me that she hardly knew the time except at sunrise and sunset.

From this lake we crossed the Kamba Pass into the valley of the great river which flows from west to east through southern Tibet. On our maps it figures as the Tsangpo, but this is merely the Tibetan word for a large river. The actual name of this river varies in different parts of its course; here it is known to Tibetans as Tsang Chu; *i.e.* "The river of the Tsang province."

As we drew nearer to the Holy City we passed many pilgrims going and returning. Some of these were covering every inch of the way by prostrating themselves. Lying on his face the pilgrim makes a mark with his fingers a little beyond his head. Rising, he brings his feet to this point and again, muttering a prayer, prostrates himself. We met a Mongolian pilgrim who was travelling thus from Lhasa to the Yambu Chōten, a sacred Buddhist shrine near Katmandu, a distance of some 700 miles. He had already been three and a half months on the road, and would take at least two years more to reach the goal of his pilgrimage. Slabs of wood were fastened to his hands to prevent them from being torn to shreds on the stony ground. Pilgrims from Eastern Tibet, seeking the sacred lake of Manasarowar in Western Tibet, have been known to traverse 2000 miles in this manner, a journey which takes them from seven to ten years.

Perhaps some of our party, more than three-fourths of whom were Buddhists, were inclined to envy these pilgrims on account of the amount of religious merit which they were amassing by these mortifications of the flesh. But we were entitled to consider that we too were not entirely without religious merit. We had come to Lhasa in winter over the high Tibetan passes and tablelands. We might have expected gales and blizzards; and indeed a blizzard was raging on "The Plain of the Three Sisters" until the very day that we reached it. But to us the weather had been remarkably kind. Now the Tibetans have unlimited faith in the power of the mind. They believe that it can influence a man's material surroundings; that it can even influence the climate. My Tibetan friends quoted to me the verse—

> Deeds white and black, for minds are clean and foul.
> Is the mind clean? Then earth and sky are clean.
> Is the mind foul? Then earth and sky are foul.
> For 'tis upon the mind that all depends.

The good weather with which we were favoured was thus doubly good for us.

Crossing the Tsang Chu, where we were joined by one of the Dalai Lama's secretaries, the road runs down it for a short distance and then follows up the Kyi Chu to Lhasa 40 miles away. A few miles from Lhasa we crossed this river by a remarkably fine bridge, known as

Tölung Tresam, "The Bridge at the Corner of the Upper Valley." Tibetan names usually give a good deal of information.

We drew nearer to Lhasa, but still we could not see it. It seemed as though the Holy City must be screened from the outside world as long as may be. Two low hills blocked the view. On one stands the Temple of Medicine; on the other the palace of the Dalai Lama. It is not until you pass under the long arch of the chöten or stupa, known as the Pargo Kaling, that the town bursts on your gaze. We were now in front of the Dalai Lama's palace, the famous Potala. In it are the Dalai Lama's own rooms and numerous chapels, occupying the yellow and red portions of the great building. Behind the white walls are quarters for Ministers of State and ecclesiastical officials as well as a college, containing one hundred and seventy-five priests, who are in immediate attendance on His Holiness. The Dalai Lama has frequently to come to the Potala for religious ceremonies, but lives as much as possible in his country palace at Norbu Lingka, "The Jewel Park," a mile away, and two miles from Lhasa. This he finds cleaner and healthier. It affords him also more privacy and more room for exercise.

Travellers in Tibet seldom, if ever, fail to notice the lack of cleanliness among the people. However strong may be the justification for such remarks. we must remember that an elevation of 12,000 to 15,000 feet above sea-level gives a very cold climate, and that the Tibetans have not arrangements, as we have, for heating their houses or their water. The Tibetan himself, indeed, does not appeal to considerations of this kind. He views the matter from a different standpoint, and deals with it in one of his short and simple proverbs. Before quoting this I must explain that Tibetans divide humanity into two classes: Buddhists, whom they refer to as "the inside people," and non-Buddhists, whom they refer to as "the outside people." And so their proverb runs:

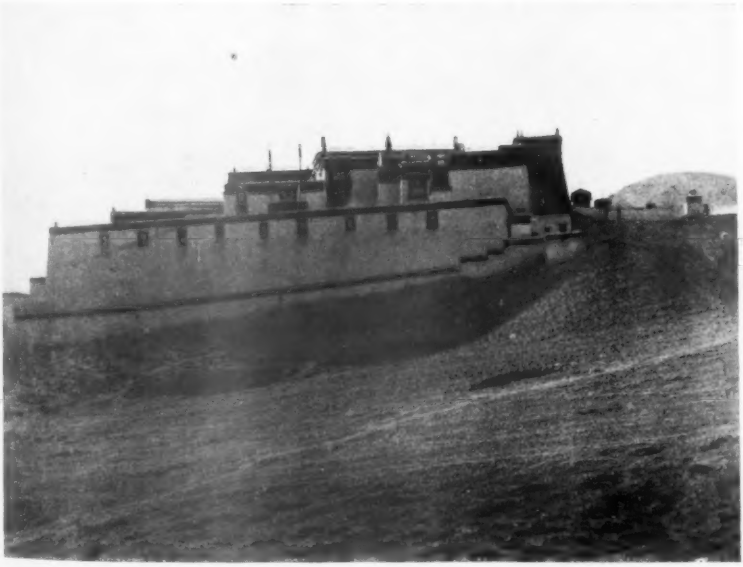
> The outside man is clean outside;
> The inside man is clean inside.

A bare mile beyond the Potala is the city of Lhasa, lying on the broad plain surrounded by groves of willow and poplar. The houses are large and substantial, built of stone and sun-dried brick. There are no brick-kilns.

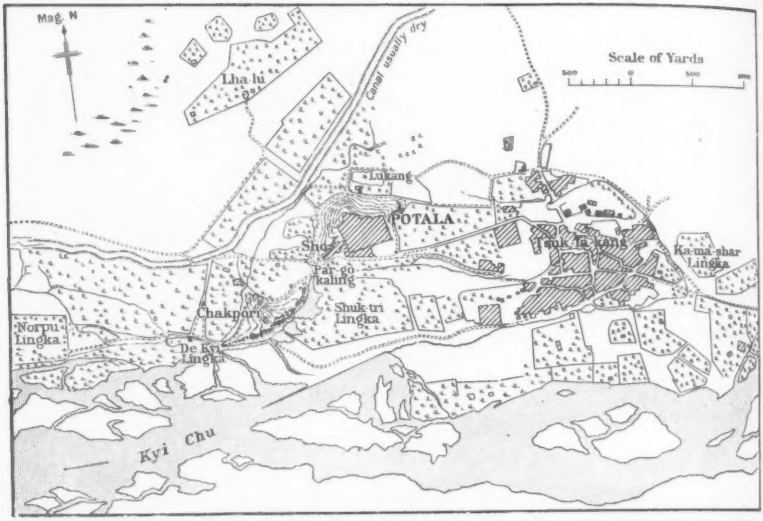
Lieut.-Col. Kennedy, I.M.S., for whose services I had asked, joined us a week after our arrival. Mr. Dyer, the Civil Surgeon at Gangtok, who had accompanied us to Lhasa, returned to his work in Sikkim. Our party was now complete. Among my colleagues, to each of whom I owe more than I can express, was Kusho Palhese, a member of the Tibetan nobility, who had worked with me for seventeen years and had taught me much, very much, about the Tibetan people, their language, their customs, and their government.

Our first days were largely occupied in paying and receiving numerous

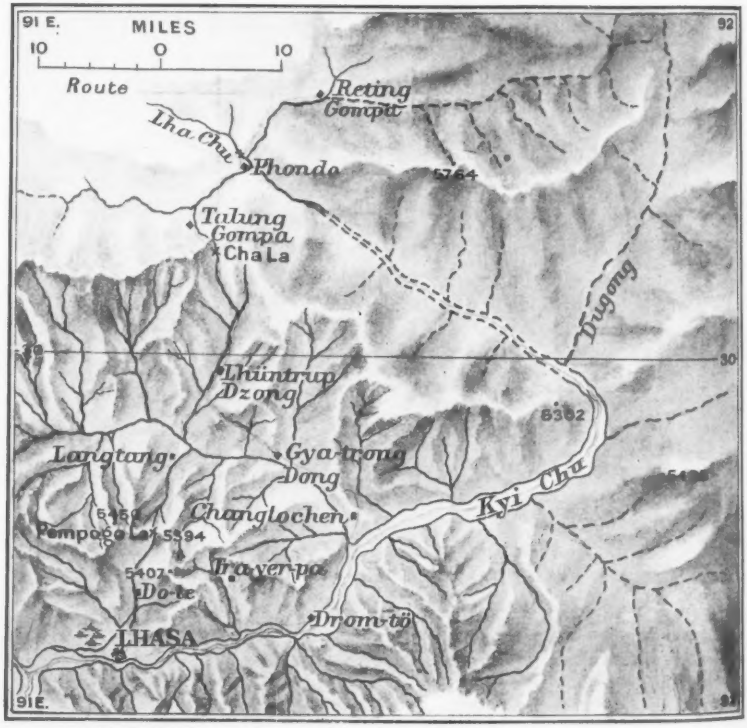
THE NATU LA BETWEEN SIKKIM AND TIBET



SAMDING MONASTERY



SKETCH-MAP OF LHASA, FROM THE SURVEYS OF COLONEL RYDER ON THE TIBET MISSION OF 1904



SKETCH-MAP OF COUNTRY BETWEEN LHASA AND RETING

visits. Everything in Tibet centres on the Dalai Lama, so that my first visit was necessarily to him in his country palace in the Jewel Park. He received me as an old friend. We sat together in one of his private rooms, fitted up half in Tibetan, half in European style. He dismissed everybody from the room so that we two could talk together alone, free from all restraint. In all our conversations both in India and here in Lhasa he was singularly frank. After this I exchanged visits with the ministers and other leading people in Lhasa.

Three or four months before I came to Lhasa, the Royal Geographical Society and the Alpine Club had asked for permission to attempt the ascent of Mount Everest through Tibetan territory. I felt bound at that time to oppose the project, for I knew that the scheme would raise suspicion in the mind of a people circumstanced as are those of Tibet. Difficulties of this kind cannot be smoothed out in letters. When, however, I came to Lhasa, the matter being left to my discretion, I asked the Dalai Lama and obtained permission for the Expedition. Personal intercourse removes many misunderstandings. In this, as in all talks with the Dalai Lama, I found him full of tolerance. It was certainly a noteworthy fact that Tibet should grant to Britain, her former enemy, a privilege which Britain's own ally, Nepal, had felt unable to accord.

I understood that the country, in which the great mountain is situated, is known as Chamalung, an abbreviation—such abbreviations are common in Tibetan—for Cha Dzima Lungpa, "The Country where Birds are kept," *i.e.* "The Bird Sanctuary." I was informed that it was so referred to in a Tibetan work, known as the Mani Kabum, which relates to the time of the famous king, Song-tsen Gam-po, in the seventh century of our era. In this book it is stated that birds were fed in Chamalung at the expense of the king. But the name can hardly refer to the mountain as a whole. Any name ending in lung or lungpa denotes a valley or other land lying lower than land near it. And the bird sanctuary would be on the lower slopes rather than in the snowy wastes which hold the upper lands of the mountain in their death-like grip. Tibetans often leave mountain peaks unnamed, whether these be great or small.

Visits to the streets and shops of Lhasa were not without interest. The goods are exposed for sale partly in the shops, partly on the road outside. It may interest you to see two or three as samples of the rest. Vegetables are not eaten largely in Tibet, for it is difficult to produce them in such a cold climate. The Chinese and semi-Chinese element are the chief growers of vegetables, but they are sold here and there in Tibetan shops.

Since his return from India in 1912 the Dalai Lama has started a meat market in Lhasa. I dare say our Food Inspectors would not pass it. But for Lhasa it marks a great advance on previous arrangements and meets the requirements of the people.

The staple diet of Tibet is yak's meat, mutton, barley flour, cheese,

butter, and tea: especially tea, of which every Tibetan drinks at least ten or fifteen cups a day. The average daily consumption might be about thirty, but there are many who drink fifty or sixty cups regularly every day. The tea, which is as a rule of a coarse quality, is grown in China and is pressed into the shape of bricks, which on their long journey through Tibet are encased in coverings of hide. They are carried on the backs of ponies, mules, or donkeys, of yaks or other cattle, and thus travel from the extreme east to the extreme west of Tibet, a distance of some 3000 miles across the great mountains and valleys of this difficult country. The yak, which is one of the chief beasts of burden, covers only 1½ miles in an hour, and perhaps 10 to 15 miles in an ordinary day's march. So the journey takes a long time, and the tea must of necessity be well packed.

In our own country it would no doubt be difficult to prescribe when winter will begin and when it will end. Our ministers, officials, and clergy would resent being forced to wear an overcoat on a warm day or forbidden its use when an icy north wind was blowing. But Tibet, in this as in so many other matters, does things differently. On the anniversary of the death of Tsongkapa, who in the fourteenth century reformed the Tibetan Church, winter commences. On the eighth day of the third Tibetan month it ends. This places winter between a fixed date in the first half of December and another in the last half of April. Between these dates all officials, lay and ecclesiastical, must wear fur hats and cloaks after prescribed patterns. Outside these dates, however cold the day may be, they are not allowed to do so. The Tibetans are in the main an orderly people. Even the brigands, of whom there are plenty, are governed largely by rule. Many of them are highway robbers for six months in the year in their own districts and peaceable traders when they visit Lhasa and elsewhere. Nobody minds this: it has been so since time immemorial. Many of these brigands are markedly prosperous. They find the combination of business profitable; trading in other districts and robbing in their own.

In Lhasa there is frost at night for eight months out of the twelve. From the beginning of December to the end of January the temperature in some of the rooms in our house did not rise above freezing-point, night or day. Our highest temperature in the summer was 91° Fahrenheit in the shade; our lowest in the winter 10° below zero. What made it really cold was the strong wind, which attains its greatest violence during the winter and spring months. Tibetan residences are plentifully supplied with windows; we had about fifty in the small house in which Colonel Kennedy and I lived. Instead of glass you have white cloth in these barely thicker than muslin, a somewhat incomplete protection against the winter gales at an altitude of 12,000 feet.

Lhasa is the home of festivals. They take place on specified dates throughout the year. I shall have time to touch on only a few of them,

and that briefly. The Tibetan calendar differs from ours. Their New Year falls in February; when we were in Lhasa it fell on the eighth. Four days before it the Dalai Lama made a State Entry into the Potala from his country palace.

In Christian lands on the last day of the year midnight services are held in the churches that men and women may repent of the sins of the old year and start afresh in the new. Something of the same kind may be seen in Tibet, though the manner of action is different. Two days before the close of the year a monastic dance is held in the great court-yard of the Potala. Its object is to cast out the evil of the old year so that the new year may start fresh and clean.

On the first day of the new year the leading priests make their obeisance to the Dalai Lama in the Potala. The next day is known as "The King's New Year." We attended it, and a most interesting ceremony it was. It represents events in the times of the kings of Tibet, one thousand to twelve hundred years ago, when Tibet was probably one of the most powerful nations in Asia. There are religious services and songs, a dance with axes, a dance with swords, and theological disputations between two of the leading doctors of divinity. In an interval between these all Tibetan officials, from the ministers downwards, made their obeisances to the god-king, and received his blessing.

At one point there was an interlude that, though comical, was not without its significance. A large number of low square tables were brought in and placed in the centre of the hall. On them were laid fruits, cakes, sweetmeats, dried carcases of sheep, and the head of a bull. These had all been blessed by the Dalai Lama and were meant for the sweepers, grooms, sedan-chair carriers, and other servants of His Holiness, that these poor folk, though not admitted to the ceremony, might share in the general rejoicing and in the blessing. The doors were thrown open and in they rushed. With them crowded in a number of outsiders, eager also to gain some of the food, not because they were poor—most of them were not—but because it had been blessed by the Dalai Lama. These thrusters were belaboured by the door-keepers, strongly built men, between 6 and 7 feet in height, who laid on with thick sticks, one stick breaking in the process. The intruders, however, seemed to care but little, provided they could gain the blessing that came with the food. Like Jacob in the Bible, each wrestled for his blessing and refused to let go, even though he was hurt.

At this ceremony, and at certain others during the next two months, Tibetan lay officials wear a special uniform with a white cap. These caps were introduced by King Song-tsen Gam-po, when, some twelve hundred years ago, he introduced Buddhism from India. They represent the turbans worn by Indians.

Now begins what is the most important festival of the whole year. It is called Mönlam Chempo, *i.e.* "The Great Prayer," and lasts for

twenty-one days. People flock into Lhasa from all directions, especially monks, and most of all those of the great monasteries. The population of the capital, which is ordinarily perhaps fifteen to twenty thousand, is swollen to four or five times this number. More than three-fourths are monks, many of them spoiling for a fight. It is a time of grave anxiety for the Dalai Lama and his Government, as in times past there have been serious outbreaks leading to wholesale massacres. "The monks," as the Dalai Lama used to tell me, "act on the spur of the moment; they never stop to think." During this particular year everybody feared an outbreak owing to some measures which had been brought forward by the Tibetan Government, and were by most of the people believed to have been inspired by me. These measures, though necessary, were unpopular among many of the people and especially among the more bigoted section of the priesthood. Householders, large and small, were sending away their property by night and hiding it in the villages in the country. However, by a judicious mixture of tact and firmness on the Dalai Lama's part, the danger was eventually averted.

Throughout the "Great Prayer" religious services are held thrice daily in the great Temple in Lhasa. I watched the proceedings at one of these, and found twelve thousand monks taking part in the service. They were divided into sections and placed wherever room could be found for them.

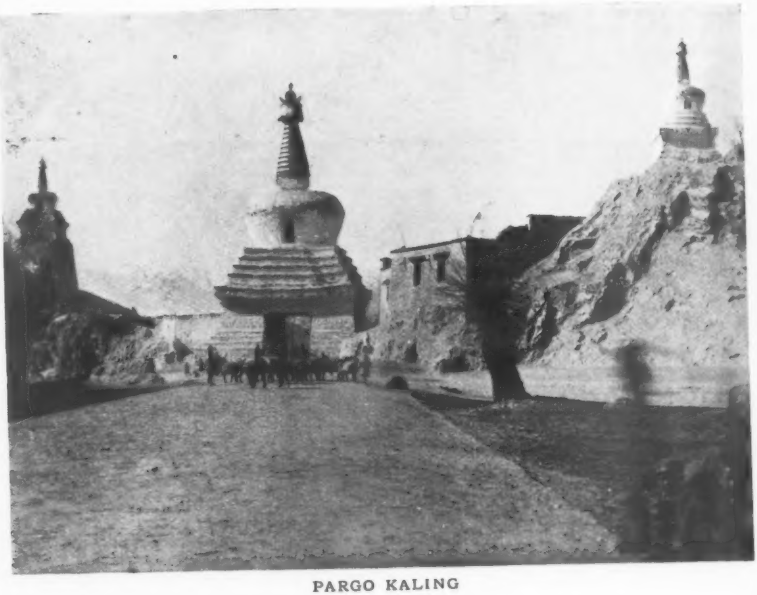
On the night of the fifteenth day we attended a festival which is known as "The Offerings of the Fifteenth," but may briefly be described as the Butter Festival. The monasteries, ministers, and others make offerings of butter, eighty or ninety offerings in all. Each is in the form of a triangular wooden frame, 40 to 60 feet high, with a sharp apex. On the frame is stretched a covering of leather, and on this are figures, pictures, etc., all of butter, painted in various colours, and often covered with gold leaf. On each side of the frame is an ascending dragon; in the middle a circular flower or wheel, usually red. Below are figures, in groups and alone. The whole is tastefully and elaborately designed, and the figures are carefully moulded. And all are made of butter. On the top of each offering is a red silk umbrella.

As it was night and the festival took place in the heart of Lhasa, the authorities were very nervous for our safety. The tension among the monks was high. There were a good many of them in Lhasa at the time, the streets were narrow and unlighted, and a stone could easily be dropped or a shot fired from the darkness of a neighbouring house. But we had attended other ceremonies, and the people would have drawn wrong conclusions if we had not been present at this one. By the Dalai Lama's orders twelve soldiers accompanied us, and six monks equipped with long staves. The crowds made way for us, and we were able to make a thorough inspection of the various interesting exhibits. In some of these small platforms were arranged, and the figures made to move by

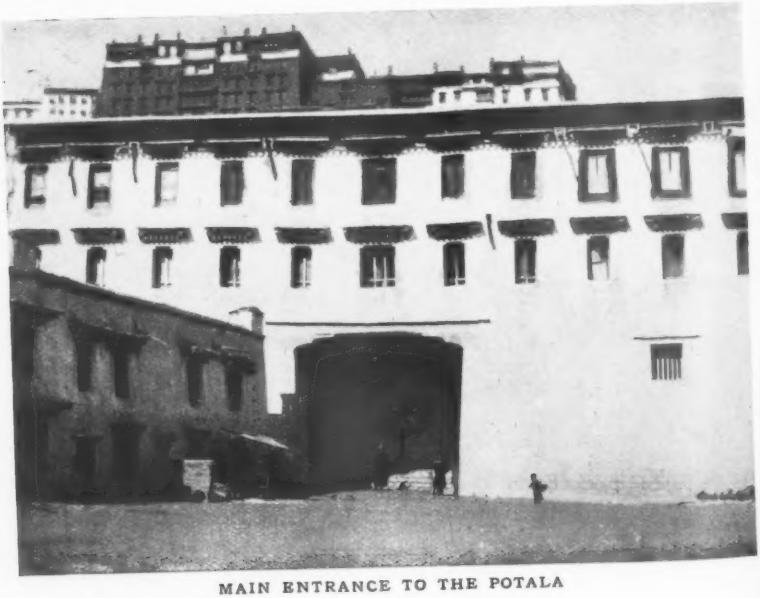
TÖLUNG TRESAM

THE NORTHERN QUARTER OF LHASA

THE TWO SHENGOS WITH IRON RODS OF OFFICE



PARGO KALING



MAIN ENTRANCE TO THE POTALA

strings pulled from behind and below. The countrymen stared agape at this marvellous performance; the sophisticated town lads laughed, but enjoyed it just as much.

It is a pleasure to be able to record that, when the trouble broke out again five months later, the monks themselves, suspicious though they are of the foreigner, desired my arbitration in the dispute.

During the concluding days of the " Great Prayer " there were sports of various kinds, gun-firing and arrow-shooting on galloping ponies, a pony race without riders, a foot-race over a 6-mile course, wrestling, and the carrying of a heavy weight. These sports are presided over by two masters of ceremonies, who are chosen from the youngest officials just beginning their career. They are attended by a large staff, including six Maids of Honour chosen from the ladies of Lhasa.

The festival of the " Great Prayer " is in its essence a prayer to the next Buddha, " The King of Love," to come quickly. And when it was over, all dispersed to their homes far and near, and as they went you could hear some of them singing:

> Lhasa's Great Prayer now is ended;
> And the King of Love invited.

Many of the ceremonies in the Great Prayer illustrate events in the times of the early Tibetan kings. Some of these kings conquered territory in China and India, and recorded their conquests, their treaties, and their internal affairs on monoliths in Lhasa and elsewhere. But one of them, a young man, departed from the ordinary lines and introduced a measure somewhat akin to the capital levy of which we hear so much at present. The wealth of the country was divided equally among all the people. But the equality soon disappeared. He tried again, with the same result. Yet a third time the division was made. But during their times of ease the poor had lost the habit of working, and so became poorer than ever. After this third attempt the king was poisoned by his mother.

The present Dalai Lama is the thirteenth of the series. Soon after each one dies, or, as the Tibetans say, retires to the heavenly fields, his spirit is believed to pass into the body of a newly born boy. The fifth Dalai, who was the first to rule as a king and is the most highly revered of the whole series, introduced the present system of administration in Tibet. Among other innovations he transferred the civil and criminal jurisdiction of Lhasa city to two monks during the Prayer festival each year. The ordinary judiciary and police are for the time removed, while these monk-magistrates, known as Shengo, hold control throughout the city with their own henchmen. In former days they were not scrupulous as to how they exercised the control, provided that their coffers were filled. Many abuses resulted, heavy fines were imposed on trifling pretexts, and people used to flee from Lhasa to avoid the

exactions. During the early years of his rule over twenty years ago the young Dalai Lama sent for the two monk-magistrates.

"By whose authority do you do these things?" he asked.

"By the authority of the Great Fifth Dalai Lama," they replied.

"And who is the Great Fifth Dalai Lama?" queried the young ruler.

Though taken aback for a moment, the Shengo did not fail to answer, "Without doubt Your Holiness is he."

"What I have given I can take away," came the quiet reply, "and I will assuredly do so unless you cease from your exactions."

From the date of that interview the worst abuses ceased, and the good people of Lhasa have always been grateful to the Head of the Faith for his intervention.

The Dalai Lama's government rules an area of some half a million square miles, with a population averaging only five or six to the square mile. It is a land of mountain, desert, and unbridged rivers, a land of snow and ice and blizzards. There are no railways, no roads as we understand them, no motor cars. There is, practically speaking, no carriage, cart, or other wheeled conveyance of any kind from one end of the land to the other. The country is poor. When these limitations are considered, it must be admitted that the Lama and his Government exercise a very creditable control over their territory. It is not indeed as close a control as in Nepal, one of their southern neighbours, where the Gurkha proverb runs:

> There's no answer to an order;
> There's no medicine for death.

But Nepal has a dense population concentrated in a comparatively small area.

Law and order are maintained in those portions of Tibet which are still under the Dalai Lama's rule far more successfully than in the parts of Tibet which have been annexed by China, or in China herself.

Numerous indeed were the religious ceremonies that we attended throughout our stay in Lhasa; many were the monasteries that we visited, with their monk inmates ranging from thirty to ten thousand. And often after a round of such visits I seemed to hear the gentle voice of the old Prime Minister, who from the first had spoken to us as follows:

"There are in Tibet many religious ceremonies, many monasteries and innumerable priests; but the whole of our religion can be summed up in one short verse, a verse that every Tibetan knows:

> Taking self as an example,
> Do ye good, not harm, to others;
> This, just this, is Buddha's teaching."

The same thing, is it not, as "Do unto others as ye would they should do unto you," or "Thou shalt love thy neighbour as thyself"?

The Tibetans like being in the open air as much as possible. During

the summer they often spend the whole day in picnics and other out-door entertainments; sometimes right out in the open, sometimes under awnings. The time is spent in feasting, singing, dancing, and gambling, in having a good time generally. Towards the end of the summer theatrical entertainments take place. The Dalai Lama starts the ball rolling in the Jewel Park with a series of plays that continue for a week. I followed with an entertainment to my Tibetan friends that lasted for three days; a separate play being performed daily. The play began each day in a park near Lhasa at about ten o'clock, and ended with the daylight nine hours later.

On August 24, by the Dalai Lama's invitation, Colonel Kennedy and I left Lhasa for a tour along the northern road from Lhasa to Mongolia. This had, I think, never before been visited by white people except by Huc and Gabet, the well-known Lazarist missionaries who had passed along most of our route seventy-five years before, but have not left much record of this portion of their journey.

Crossing the Pempogo pass, we descended to the Pempo valley and halted for the night at the monastery known as "Elephant Plain," built in the twelfth century. We were accommodated in the large Assembly Hall. We found here the mummy of an Indian saint, who is believed to have lived over nine hundred years ago. We saw also a chöten or stupa erected by the founder as a protection against epileptic fits, these being held to be due to planetary influence. The protection is gained by walking round the chöten.

The following day we crossed the Pembo river, with some difficulty, for it was swirling along flush with its banks, and halted at Lhüntrup Dzong. Our next march took us over the Cha pass to the Talung monastery. On the way we passed several parties of Mongols and of people from the far distant regions of north-eastern Tibet. I had chosen this time for the tour as being the time when the summer caravan comes into Lhasa from Mongolia and Siberia. Once every summer and once every winter the long trek across the high cold plateau of northern Tibet is undertaken. The parties of pilgrims and traders unite in one large caravan as a protection against brigands. Arrived at Nagchuka, 150 miles north of Lhasa, they await the Dalai Lama's permission to continue the journey, and then proceed in small parties to Lhasa. The journey from Mongolia takes about four months.

We were now leaving behind the agriculturalists of Central Tibet, who enjoy the comparative luxury of a settled existence, and are approaching the land of pastoral nomads who raise no crops, but wander over the country with their flocks and herds. We saw many plants of the wonderful blue poppy of Tibet, which was then in full bloom and flourishing from an altitude of 13,500 feet upwards.

The head of the Talung monastery—the word means "The Tiger's Prophecy"—is known as "The Precious Mother," which seemed a

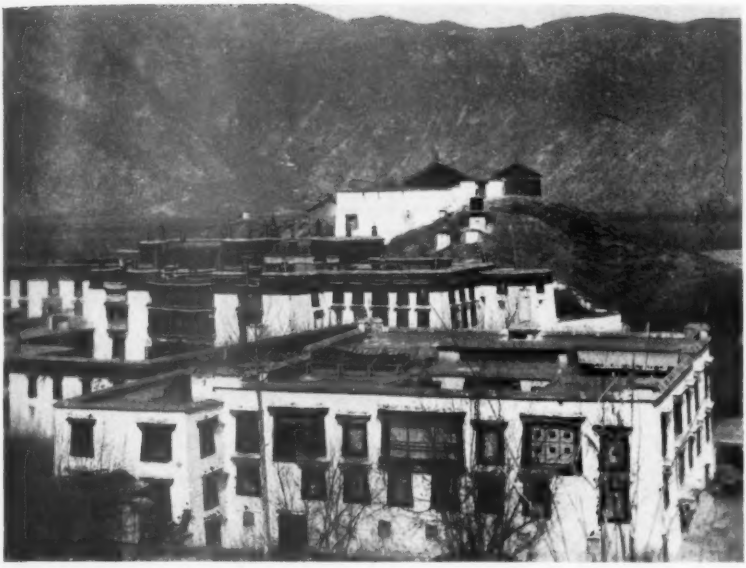
somewhat curious title, for the head in question was a boy four years of age. Another curious feature in this monastery—which, lying off the road, was probably not visited by Huc and Gabet—was its old library. Ten to twelve thousand volumes, each in its massive wooden covers and said to be written in gold letters, were piled against the walls. These books were saved from the fire that destroyed the great chapel of the monastery several hundred years ago. As a result of this experience they are now pensioned off. They are not put to further use, but rest in peace against the lofty walls. We found the same state of affairs at Reting, a new library taking the place of the old.

On our march to Pondo we passed a small house of religion built into the face of a precipice, whose priest had remained seated Buddha-wise for twelve months, so that now he was unable to stand upright. He has a reputation for learning as well as for sanctity. Young priests come to him from all over Tibet to receive instruction in the Buddhist scriptures.

At Pondo there is a suspension bridge for foot-passengers over the Lha Chu, one of the very few suspension bridges in Tibet that are usable. Tibetans ascribe the building of such bridges in Tibet to a priest named Tang-Drong Gyal-po, who lived some hundreds of years ago. Images of this saint are put up where there is danger of a river overflowing its banks, for he is believed to have power over water. From near Pondo we saw a small portion of the Nyenchen Tanglha range. Round and about we passed many parties of Mongols and others from the north on their way to Lhasa. They ride ponies, mules, and yaks, but not camels. These are largely used on the northern plains of Tibet, but are not allowed on the Lhasa side of Nagchuka.

Seven miles beyond Pondo we left the north road, a mere track leading up a side valley to the left. Another 6 miles brought us to Reting, which is 64 miles from Lhasa. Reting owes its reputation mainly to two things. The first is this: though trees in Tibet do not usually grow at a much higher altitude than 13,000 feet, and then but sparsely, here and there, yet round Reting there is a dense forest of juniper trees growing up the mountain-side up to and beyond an altitude of 15,000 feet. Tibetans regard this as a miracle and ascribe it to the prayers of the most famous of the early Tibetan kings, Song-tsen Gam-po, who lived thirteen hundred years ago. Cutting off his hair, the king strewed it on the ground and prayed that trees might grow from it to enable a temple to be built. The temple and monastery were built three hundred years later. There are twenty-one thousand trees altogether; it is not allowed to cut or lop any of them except for building material. Several of the trees have names of their own.

The other great possession of Reting is its *Cho*. A *Cho* is an image of Buddha made under the direction of Buddha himself. There are said to be only three in Tibet, two in Lhasa and one here at Reting.



KÜNDELING MONASTERY, IN WHOSE PARK THE MISSION LIVED

A PICNIC PARTY

THE LABRANG (ADMINISTRATIVE BUILDING) OF RETING MONASTERY

LHÜNTRUP DZONG

One of Reting's unconsidered possessions was a fine Tibetan mastiff, who lived in a courtyard outside our rooms. He had a deep soft bark—a sign of good breeding. For the bark, say Tibetans, should be like the sound from a well-made copper gong.

The river at Reting is the same as the river at Lhasa, but it winds for 150 miles on its way from Reting to the capital. I went only a few miles beyond Reting, as I could not afford to be too far from the nearest telegraph office, which indeed at Lhasa was full two days' journey distant.

On leaving Reting, with its little hermitage nestling in the trees above it, we returned to Lhasa partly by the same and partly by a different route.

But it is time to conclude. We left Lhasa on October 19, and on the 18th I paid my farewell call on His Holiness the Dalai Lama. It was a sad parting for us both. When I left I felt that there were but few Orientals whom I knew as well as the mysterious personage who governs Tibet. On our departure next day, in addition to the usual receptions, guards of honour, etc., the Dalai Lama himself stood on the roof of a neighbouring house to watch us pass, and was thus himself in full view of the people. Such an action on the part of the God-King, whose sanctity requires seclusion from the eyes of the crowd, was probably unprecedented in the annals of Tibet.

Before the paper the PRESIDENT (Lord RONALDSHAY) said: We are to-night to have a first-hand account of the city of Lhasa, and that, as I need hardly remind you, is a somewhat rare privilege, for the number of Europeans who are competent to give a first-hand account of that city is necessarily very small. Rather more than a hundred years ago an eccentric traveller by the name of Manning made a journey which took him eventually to Lhasa, but his Diary reflected his own eccentricities and gave us very little information with regard to the city. Then some three-quarters of a century ago the world was startled and entertained by the descriptions given by those famous Lazarist missionaries, Messieurs Gabet and Huc. After that the curtain fell upon Lhasa and was not raised again until 1904, when the famous Younghusband Mission made its way to that city. That Mission, no doubt, did much to lay the foundations of good relations between ourselves and the people of Tibet, but it must necessarily have appeared to the Tibetans as the strong arm of Great Britain which was imposing terms upon a recalcitrant neighbour. Since then, however, the most remarkable change has come about in the relations between the Tibetans and ourselves. At the present time the Tibetans are most friendly towards Great Britain, and I have no hesitation in saying that that extraordinarily satisfactory state of affairs is very largely, if not mainly, due to the last twenty years of work which have been put in by our lecturer this evening, Sir Charles Bell. The friendly relations which he was able to establish with the Tibetans, and in particular with the Dalai Lama, culminated in the invitation which he received from the latter to visit his capital, and that invitation at last materialized in a visit to Lhasa by Sir Charles Bell which extended over a period of a full year. Sir Charles Bell, therefore, is particularly well qualified to inform us of those changes that have taken place in Lhasa since we last had an authentic account of it given by the Younghusband Mission, and I have much pleasure in asking him if he will now give us his account.

Sir Charles Bell then read the paper printed above, and a discussion followed.

The PRESIDENT: I am sure you would like, before we disperse, to hear a few words from Sir Francis Younghusband.

Sir FRANCIS YOUNGHUSBAND: I should like, in the first place, to endorse all that the President has said as to the value of the work which has been done by Sir Charles Bell during the last twenty years on the Tibetan border. It is very largely, perhaps chiefly, due to that work and to his capacity for entering into the life and thoughts and feelings of the Tibetans that our relations with the Dalai Lama's Government are so favourable as they are to-day. It is always a good way of getting to the hearts of an Asiatic people to study their literature, and especially their sacred literature. It is to that work that Sir Charles Bell has devoted many years of his life, and because of it he was able to get that friendship with the Dalai Lama himself which has been of such incalculable value to us. We in this Society are especially indebted to Sir Charles Bell, because it was through his personal influence with the Dalai Lama that we were able to get sanction for the Mount Everest Expedition to attempt to climb the highest mountain in the world.

The President has said that the number of Europeans who can give first-hand information with regard to Lhasa itself is very small. I regret to say that during the last few months two of that very small number have died. First of all, Sir Henry Hayden, a very able geologist, who was a member of my Mission to Tibet. He was a most delightful companion and very enterprising traveller, who not only went with me to Lhasa, but who last year, at the invitation of the Dalai Lama himself, had proceeded there to advise the Dalai Lama on the geology of Tibet, and who last summer lost his life in the Alps. And just this last few days we have heard of the death in China of that adventurous traveller, General George Pereira. General Pereira had only last autumn completed a great journey across China, from Peking right through Tibet to Lhasa, and from Lhasa to India. I should like to take this opportunity of bearing testimony to the great value of what a traveller of the character of General Pereira does in countries like Tibet. He was a born traveller, and travelled for the sake of travel. The world knew very little of what he did. He went out in a most modest way, telling hardly any one where he was going. But he for years travelled through China and Tibet. And it is by the influence of travellers of his description that the good name of England is carried on in out-of-the-way parts of Asia.

Sir Charles Bell has given us some very interesting details about the way of life of these Tibetan people. I gather from him that he had a very clean mind, because when he went across the passes he had very favourable weather. My mind cannot have been as clean as that of Sir Charles Bell, or at any rate some of my companions must have had very dirty minds, for certainly when we crossed the passes there were the most terrific blizzards. It was just this month twenty years ago that we made our preparations at Darjeeling to cross the Himalaya by a pass 15,200 feet high in the month of January.

We had with us a very enthusiastic correspondent of the *Times*, Mr. Percival Landon, and for weeks before we ever reached Lhasa he used to go on in front and ascend hills thousands of feet and be quite convinced that there away in the distance he saw the glittering roofs of the Potala. As Sir Charles Bell has told us, we could not see Lhasa until we were immediately upon it, and the Survey Officers assured Percival Landon that there were at least three great ranges in between him and Lhasa. However, he always used to imagine to himself that through some chink he saw the roofs of the Grand Lama's palace.

We eventually reached there, as you know, and entered Lhasa by that chöten of which we had a photograph this evening. But I noticed a change, for there is now a nice straight well-fenced road up to the gate, whereas when we went through we had to make our way through puddles over a very rough road. In Lhasa itself I rather think that I signed the Treaty in that hall in which you saw the Grand Lama seated in state, but on that occasion there was a magnificent silk curtain pulled down in front of the Dalai Lama's throne and a table put in front of it, and on that the Treaty was signed.

Sir Charles Bell has referred to the monks of Lhasa and the great monasteries there, some of which he says contain 10,000 monks. When we were there the monks were troublesome to a certain extent, but not nearly so troublesome as in ordinary times. The only really serious trouble we had was with a monk who ran amok in our camp, and suddenly drew out his sword and cut down an officer. We tried the man, and asked him why he had done this, and he said that as he was going through our camp he saw the officer wearing an ugly hat. So he thought he must knock off the hat, and when he knocked the hat off he saw the officer's face was uglier than the hat, so he thought he would have a slash at that too. The officer was very much annoyed about this, and kept muttering about it for many months afterwards. But on the whole I may say that we parted good friends with the Tibetans, and had the feeling all the way through that they were really quite friendly people. We had no special enmity with them, and it was exceedingly important that we should not establish any permanent barrier between us. I am glad to say that, thanks to Captain O'Connor especially, who was my secretary there and spoke the Tibetan language and had a great liking for the people, we were in the end able to get on quite friendly terms with them.

Just before we left we went to a great festival in the Cathedral at Lhasa. Sir Charles Bell has described to us something of Tibetan religious ceremonies, and I must say I also was greatly impressed by them: by the masses of Tibetan monks and lamas, the great trumpets and cymbals and drums, and, most impressive of all, the deep voices to which the Tibetans are especially trained. One got the sort of feeling that these were a big people with a deep sense of religion and great power and reverence. And that, I think, is what Sir Charles Bell wished to convey to us. I would like to congratulate Sir Charles Bell and to thank him for the details which he has given us this evening of every aspect of Tibetan life. I would also express the hope that he will spend the next three days in going up and down amongst the electors of Great Britain giving an account of the Tibetans' experience of a Capital Levy!

The PRESIDENT: Sir Charles Bell has given the Dalai Lama and his Government a number of testimonials, and amongst them a testimonial as to the good order and good government of the country. The order preserved in Tibet, he said, was greater even than that which one found in China. In view of the state of affairs in China at the present moment, I am not sure that this is a testimonial which the Tibetan Government would wish to cry from the housetops. But it so happens that we have present a gentleman who with great ability has represented this country in China for a great number of years, Sir John Jordan, and he therefore may like to say a word or two.

Sir JOHN JORDAN: It is always extremely difficult to speak about a subject on which one knows nothing, and that is my position here to-night; but Lord Ronaldshay has very kindly asked me to say something from the Chinese point of view, and I suppose that is a *rôle* I ought to accept. In the first place, before saying anything about China and China's relations with Tibet I should like to

express the very great interest with which I have followed the lecture. It has given us a deep insight into the life of Tibet and especially of Lhasa.

As you know, we in China have always been rather in competition with India as regards Tibet, and I suppose I have been asked to-night to show the other side of the picture, so to speak. We were interested in Tibet long before India took any interest in the subject at all. In the seventh century we sent a princess to Tibet who became the wife of that first King of Tibet whose name was something like "Strong Bow" (Srong-tsan-gampo). That lady left Peking in the T'sang dynasty, one of the most illustrious dynasties in China, which covered a period of great literary activity, and is still regarded as marking the highest stage of Chinese culture. That young lady made a long pilgrimage across Asia to civilize Tibet and became the wife of this "Strong Bow." He already had a wife—a Nepalese princess; but the princess from China took civilization and a great many things to Tibet.

I was interested in that monolith Sir Charles Bell showed us, and wonder if the writing on it referred to an early treaty with China. He said that Tibet conquered China. I should prefer to say that China conquered Tibet. Warren Hastings took much interest in Tibet, and he knew a great deal about the country in his day. He wrote a Memorandum for Bogle which might be an instruction at the present day to any one going to Tibet. And then Bogle was sent there, though he never got to Lhasa. That was about 1780. He made an arrangement to go to Peking, but that failed through the death there of the Tesho Lama, with whom he had entered into very friendly relations. The Tesho Lama was called to Peking to celebrate the seventieth birthday of the Emperor Kien Lung, and he died there of small-pox. Then China had its turn, and we sent a gentleman to whom the President has referred of the name of Manning. He was at Canton at the time, but he had been educated at Cambridge, and might, if he had chosen, have been a high wrangler. He succeeded in reaching Lhasa, but I must say I agree entirely with what the President said with regard to his Diary. Manning had one of the greatest opportunities that ever a man had; he established friendly relations with the Dalai Lama, but he was very disgruntled and spent his time in bickering with his servants. He praised the mutton, but otherwise saw little good in the country. His Diary was a most disappointing document. That was in about 1811. I think his grievance was that the Government of India had given him no encouragement.

Time passed, and Huc and Gabet went from China in 1844. In the mean time China had greatly strengthened her hold over Tibet. I do not quarrel with the lecturer in anything he has said; I only think he has omitted a good deal. He has said practically nothing about China, but, as a matter of fact, Tibet was a dependency of China. Not to go back further than 1790 or so, Nepal quarrelled with Tibet, and we sent two armies from Peking, one from the north and one from the south, to drive out the Nepalese, and followed them up to within a few miles of Katmandu. After that China sent two Residents, and for over a hundred years those Residents lived in Lhasa. The political relations of the country were entirely dictated by the Chinese Ambans, so that China had a very close interest in Tibet during all those years.

That all ended when China in 1911 became a Republic. The lecturer and Sir Francis Younghusband have quite rightly taken credit for the good that the Treaty of 1904 did. From India's point of view I admit. But then I speak for China. Immediately afterwards the Chinese said, "We will try what we can do." Just as India went in from the Indian side, the Chinese started from

their side. The districts that Sir Charles Bell has described as Tibetan territory ruled by China might rather be described as Chinese feudatory territory ruled by China at that time. As a matter of fact, in 1724 all Tibet was delimited, and all the part to the west was assigned to the Dalai Lama. The boundary was near Batang, and the part to the east was placed under feudal chieftains subject to the Emperor of China. After 1904 the Chinese came in from the Szechwan side, and made a determined effort to convert all these feudal principalities into an integral part of the Chinese Dominions. A Chinese official named Chao Erh-féng became a sort of Empire builder. He started and plundered all the monasteries, and I must say behaved extremely badly and conquered a great part of the country. During the last six or seven years of my time in China I had continual trouble over the boundary question, and all this part of the country was in a state of perpetual unrest. I want to show that the whole of that part of Tibet is not so peaceful as might possibly tbe inferred from the lecture.

Then for the Lamaist religion: I am afraid I cannot subscribe to the proverb that "the inside people are necessarily clean inside." I have grave doubts. We have a Lama temple in Peking. The Chinese emperors have always rather encouraged Lamaism from a political point of view. They established this big Lama Temple in Peking, with a large endowment, and a formidable array of priests. I can quite bear out what Sir Charles Bell has said with regard to the truculent nature of the monks. On one occasion, many years ago, when I was Acting Chinese Secretary at Peking, I undertook to take Lord Curzon to the Lama temple. We managed to get in, but we had the greatest difficulty in the world in getting out.

I would like to add that I thoroughly enjoyed the lecture, and I am very grateful indeed to Sir Charles Bell. In conclusion, I should like to associate myself very earnestly with the tribute that Sir Francis Younghusband has paid to my dear friend General Pereira. He served with me for over six years, and I can honestly say a finer man I never knew. I agree with every word that Sir Francis Younghusband has said. General Pereira was really a symbol of what a British gentleman ought to be all through the Far East; a marvellous traveller and a wonderful man who was respected by all for his innate kindness and goodness of heart. I think during all the time that he travelled in China he never had the least trouble with any man. I met him first in Seoul one day just before the Russo-Japanese war. He said, "I am going to stop here. I am going to be your Military Attaché." "But," I said, "I have no Military Attaché." "Oh," he replied, "telegraph home for permission. There's to be a scrap before long between Russia and Japan, and I am going to be in it."

The PRESIDENT: There are, of course, two sides to every shield, and we have just had the other side to the present shield from Sir John Jordan. It seemed to me he was rather trying to draw me into a discussion as to the merits of the respective attitudes of India and China towards Tibet. From any other platform I should be delighted to take up that challenge. As President of the Royal Geographical Society it would perhaps hardly be judicious for me to enter into a controversy of that kind. I shall confine myself, therefore, to joining with Sir John Jordan and Sir Francis Younghusband in the expression of gratitude to Sir Charles Bell for the excellent lecture which he has given us to-night.

THE INFLUENCE OF NATURE ON JAPANESE CHARACTER

Rev. Walter Weston

Read at the Meeting of the Society, 17 December 1923.

IF it be true, as has been stated, that the character of a man may be estimated by his attitude towards nature, then the Japanese people should occupy a unique position among the nations of the world.

No other race with which we are acquainted have the love of Nature so strongly inborn and so widespread in them. It pervades their whole life, and colours the entire range of their religion, art, and poetry, as well as of their daily pursuits and their holiday recreations.

"To gaze upon the clouds of autumn, a soaring exaltation in the soul; to feel the spring breezes stirring wild exultant thoughts;—what is there in the possession of gold and gems to compare with delights like these? And then, to unroll the portfolio and spread the silk, and to transfer to it the glories of flood and fell, the green forest, the blowing winds, the white water of the rushing cascade, as with the turn of the hand a divine influence descends upon the scene . . . these are the joys of painting." That delightful rhapsody was uttered by a Chinese artist nearly 1500 years ago, at the precise moment when the tide of Chinese Buddhism was setting towards Japan, bearing with it all those varied elements of the new civilization that was entirely to transform the whole life of the younger race, and to usher in the period well styled *Daikwa*, "Great Reform." For with the entrance of Buddhism there came in its train not merely a new religion but also all the arts and sciences that went to the remaking of the Japanese people. Great as have been the changes wrought by Japan's intercourse in modern times with the Western world, they cannot be compared with those which took place fifteen centuries earlier, when her ancient neighbour was, so to speak, invited to take in hand the task of leading the clever and ambitious pupil from a state of semi-barbaric twilight into the light of the new civilization that had already been the heritage of the Middle Kingdom for a score of centuries.

Amongst China's priceless gifts was an intelligent affection for beauty both in Nature and in art, and the sentiments of the master just quoted found an eager response from many generations of disciples in the succeeding centuries.

Before the introduction of Buddhism from China, in the middle of the sixth century A.D., such religion as they had was known as *Shintō*, "The Way of the Gods," though this could only be styled a religion in the meaning it had for the ancient Romans: a universal veneration of ancestors; a worship of all the powers of nature, in which fear and

awe were intermingled; of the sun and of the sea; of the daily food, and no less of the implements used in its preparation; a worship that has personified countless mountain peaks, swift-rushing rivers, and lovely cascades.

In the region of Art, we see how the school of living naturalism, founded by Ōkyo in the middle of the eighteenth century and perfected by Hokusai exactly a hundred years later, delights to sport with, or to idealize, the minutest facts of the natural world around them, and of the life with which it is instinct. It is true that with these masters and their school it is not the remote or the grand which most inspires them, but the near, the quaint, the beautiful. They are rather the Raphaels of fishes, and insects, and flowers, or of the graceful swaying of the tall bamboo in the gentle breeze.

Not merely the painter, however, but the carver in ivory, the worker in clay and in metal—all are caught in the embrace of an ardent naturalism. Think of the loving diligence and care of a craftsman who could devote five of the best years of his life to fashioning the feathers of the eagle of steel, shown some thirty years ago at the Chicago Exhibition.

Poetry, for the Japanese, is almost entirely an impressionist rendering of nature. The most popular subjects are such as flowers, or birds, the moon, and the falling leaves of autumn; the winter snow, and the mist upon the mountains; nature, indeed, in all its forms and under every aspect. Most Japanese poems, the common length of which is limited usually to the orthodox thirty-one syllables, are merely exclamations—suggestions intended to appeal to the imagination of the reader, or an outline, the details of which his own nature-love will enable him to fill in with unerring touch. One such was written over a thousand years ago by some nameless poet in the following terms: "The moon on an autumn night makes visible the very number of the wild geese that fly across its face with interlacing wings."

At the opening of each New Year the whole nation is invited to compete in writing odes on subjects set by Imperial direction, and of these from ten to twenty thousand are sent in, the topic prescribed being almost always on some object of natural beauty, such as "Bamboos in the snow," "Pine-trees reflected in the water," or in testimony to the universal and undying veneration for the sacred peak that arouses an enthusiasm and casts its spell on all alike, *Tōyama no yuki*, "The snow on the distant mountain." By such themes as these we are reminded that the appeal of Nature to the Japanese heart is not only inborn but age-long, for in one of the chief poems of the earliest and most famous anthology in their language—the *Manyōshū*—published in the eighth century, we find a declaration which embodies the first known reference to the "matchless peak":

> "Of Yamato, the Land of Sunrise,
> It is the Peace-giver, it is the God,
> It is the Treasure."

There is scarcely a single one of all the applied arts of Japan whose greatest masters have not found some of their highest inspiration in the fascination of its form, its colour, and its mysterious charm. The familiar cone figures in the delicate metal-work of the sword-mount of the samurai or on the nobleman's pipe-case. It also adorns the cheapest of fans, the screen in the workman's cottage, and the tiny towel that binds the peasant's perspiring brow as he toils in the sweltering heat in the ricefield during the day and which he uses at his inevitable nightly hot bath. The preacher introduces the mountain into his discourse, and by the itinerant story-teller tragedy and comedy alike are woven about its form. Not only does the dramatist or the novel-writer present it as the centre of his field of action, but the lady of high degree will often arrange her coiffure in such fashion as to suggest the outline of its graceful slopes. In spite of the terrors inspired by its fiery outbursts in bygone days, there is something wholly friendly and sociable in the way it looks down, almost protectingly, on the daily toil and pleasures of literally millions in crowded city and on country-side. It was this friendliness of Fuji that appealed so strongly to the imagination of Hokusai, and furnished his nimble fancy with that astonishing variety of subjects rendered in the pages of his 'Hundred Aspects of Fuji,' and of 'The Thirty-Six Views.' Another master has devoted nearly half a hundred of his best efforts to the delineation of the *whiteness* of the snow mantle it wears for more than half the year.

The softening and refining influence of the universal delight in the flowers which bloom in such endless variety and profusion all over the land manifests itself at every turn of life, and is associated with almost every act of the Japanese. They herald his birth, they afford the purest and most pleasing occasions of his hours of relaxation, and they accompany him to his grave: after that, they serve as the chief expression of the link of affection that still binds him to those left behind, whose pious care finds its chief exercise in the offerings so jealously rendered at his last resting-place for long years of remembrance.

An amazing tribute is paid to the nation's love of natural beauty by the way in which, month by month, nearly the whole population, old as well as young, turns out solely to enjoy the pleasure of gazing at the particular blossom then at the zenith of its loveliness. It is round these *Hana-mi*—"Flower-viewing" festivals—that the really national holiday makings of this most holiday-loving of peoples really revolve.

Earliest comes the plum-blossom, which lasts from the end of January until March, then giving place to the most admired of all these gifts of nature, the true national flower of Nippon, the cherry blossom, of which it is declared that "As the warrior is king of men, so the cherry is first among flowers." My wife and I once watched eight thousand troops embarking at Yokohama for an unknown destination in the Russo-Japanese war; not one of whom was without a tiny spray of the delicate

PILGRIM WATCHING THE SUNRISE FROM FUJI-SAN

FUJI-SAN

SLIPS OF PAPER WITH POEMS IN PRAISE OF THE PLUM-BLOSSOM

THE ONSEN OF SHIRAHONE, JAPANESE ALPS

petals in his cap. After the cherry comes, at the end of April or early in May, the gorgeous tree-peony, accompanied by the azalea, and by the wistaria, whose blossoms at times hang a length of 6 or 7 feet over the cool waters of the carp-pond of some wayside inn. In early June whole acres of irises can be seen displaying their glorious mosaic amid surrounding fields. In sultry August days the sacred lotus brings a refreshing touch of colour on the scene, and large gatherings may at times be found at early dawn by the side of some famous pond waiting for the moment when the sun's first rays shall strike the delicate petals, which thereupon burst open with the report of a pistol-shot. In November chrysanthemums of every hue and form delight multitudes of all estate, and the famous gardens of well-known public men are thrown open for their orderly enjoyment, while whole hillsides in many a wild torrent valley glow crimson and gold with a flaming mantle of maple leafage of every tint and shade, of

> "Autumn laying here and there
> A fiery finger on the leaves."

The satisfying pleasures afforded by such scenes are shared by every class. The stately secluded villa of the old-time court noble, it is true, may have its carefully placed "Chamber of the Inspiring View," from whence he can best enjoy the prospect at leisure and in peace, but no less, where possible, there will be found in the little back yard of the cottage of your coolie its own tiny landscape garden, the unceasing diversion of his infrequent leisure hours.

As we turn to the wider and, so to speak, more distant aspects of nature in their effect on the national character and tastes, we may not omit mention of the refined delights of one of the most æsthetic of all such—that known as *Tsuki-mi*, "Moon-viewing." Its peculiar features may serve to throw a little light upon some of that whimsical contradictoriness so often characteristic of the Japanese pursuit of the pleasures of life. Though the ancient cult of Shintō practically represents them as a race of sun-worshippers, and the Imperial House, according to the primeval myth, as descended from the Sun-goddess Ama-terasu, "The Heavenly Shiner," it is on the fascination exercised by the moon (oddly enough belonging to her turbulent and unruly brother Susa-no-ō) that the popular fancy most dearly loves to dwell. To such it is by no means merely a question of "all moonshine," for the age-long sentiments of poets and story-tellers have been summed up once for all by one of the most famous among them in the declaration that "all human griefs can be assuaged by gazing at the moon." The most favourite of the three festivals thus celebrated is that of what we should call the "Harvest Moon," which draws tens of thousands to the seashore, the hillside, or to the still pools among the granite boulders of a broad river-bed in quiet contemplation of the orb itself or of its reflected charms. In many homes a family gathering provides offerings of a special round flat rice

THE ONSEN OF SHIRAHONE, JAPANESE ALPS
SLIPS OF PAPER WITH POEMS IN PRAISE OF THE PLUM-BLOSSOM

dumpling, known as *Tsuki-mi-dango*, "Moon-viewing dumpling." Such occasions as these, like the domestic art of flower-arrangement, are held to inculcate a spirit of self-forgetfulness, gentleness, and abandonment of care.

Of all the poetic titles the Japanese have ever applied to their country, the most ancient is that of *Toyo-ashiwara-midzuho-no-kuni*, "The fertile reed-clad country rich in grain." It suggests that from the earliest times it is agriculture that has been the occupation of the majority of the people and the most fruitful source of their livelihood. In spite of the rapid strides Japan has made in recent years in mining, manufactures, and maritime expansion, the old adage still holds good, as it did a thousand years ago—*Nō wa fūkoku no hongen nari*, "it is agriculture that forms the basis of the nation's prosperity"; and it was not for nothing that in the old feudal days the farmer ranked next to the samurai in the social scale and above the trader and the artisan. At the present moment the rural population numbers more than sixty per cent. of the whole, and it is they who supply the nation with most of its food and with the greater part of the raw material for its manufactures. A notable feature of Japanese agriculture is the tillage of small holdings, a work which absorbs the entire energies not only of the farmer himself but also of his whole family. Only about one-sixth of the total area of the country is cultivable, and even this is not naturally very fertile. It is only compelled to yield its utmost by a minute and careful system of subsoil working, manuring, terracing, and irrigation, and these operations are carried out with a thoroughness and a neatness that almost suggest gardening rather than farming. Nearly all the work is done by hand, hoe, and spade, helped out at times by the ox or the horse, and the results are all the more remarkable on account of the primitive character of the means employed. Their plough, for instance, is that of the Egyptians of the days of Tutankhamen!

The Japanese farmer, like the Japanese sailor and fisherman, has always an incessant vigil to keep and a hard struggle to wage against those powers of Nature that affect him to a greater extent and in more bewildering variety than falls to the lot of any other of his kind. From impetuous rivers, seasonally swollen by torrential rains there is constant danger of floods: nor does he ever know when the next earthquake may not ruin his home; from some smoking volcano ashes and lava may pour forth at any moment, spreading destruction and ruin over his beautifully tilled fields on every side. These vast forces are, to the peasant, not merely untamable but also unintelligible. For long centuries he has been habituated not merely to incessant toil but to beholding its precious fruits obliterated almost in a moment of time before his very eyes. Surrounded, hemmed in, as he is by these mighty mysterious powers, he is essentially religious, though he is shy about talking of his religion to the stranger. And we find that, just as the Japanese

sailor, in facing the perils and hardships of the sea around his foggy storm-beaten coasts, has developed astonishing resourcefulness and courage, so the farmer, in his task of wresting its treasures from a turbulent land, has acquired a like endowment.

Nothing, I think, should more awaken our sympathy, and win our respect, after the constantly recurring visitations of floods, typhoons, earthquakes, and fires, than the spectacle of an uncomplaining people, without bitterness or resentment, bending every ounce of energy to the well-nigh unceasing task of removing the ashes or the sand from their once fertile fields, repairing the ravages of nature, and restoring to the soil its former fruitfulness. Of what centuries of patient toil and uncomplaining devotion the harvest fields of Japan are the result and the monument, few of us have any adequate conception.

It is in the struggle to subdue the surface of the land to the service of man that many of the finest and most solid characteristics of the bulk of the Japanese people have been developed—their boundless patience and perseverance, their intelligence, ingenuity, and self-control, their tough constitutions and their temperate habits.

The sturdiest fighting men in the whole of the Japanese army are drawn from the peasant classes—hardy, stolid, and entirely unafflicted with nerves. Most of these come from the hill country, where their daily occupations and surroundings have left a permanent impress on their habits and their character. During the Russo-Japanese war it was remarked by foreign military attachés that, in districts where long marches had to be made, over routes leading along precipitous goat-tracks, or over pathless gullies and crags, each man having to find his own way and to rejoin his company on the other side, it was the native mountaineering habitudes of the lower ranks that led them to take the least inaccessible line of country. In mountain warfare these hillmen were held to display, as compared with other infantry, some of the attributes and much of the mobility of cavalry.

There is, moreover, something in the open and communistic character of the daily life and toil of these people, a result of their close and unremitting contact with nature and its operations, that seems to render them all the more natural and considerate, and that promotes a readiness and resourcefulness which have actually to be witnessed to be realized. Here you find human nature most unsophisticated and unspoilt, and adorned with an inborn simplicity and a native courtesy which still justifies in its truest sense the old title *Kunshi no Koku*, "The country of gentlemen."

A striking feature of the rural life of Japan is the all-important part played in it by the women. Whether it is the planting, transplanting, or harvesting of the rice that is on hand, they are always to the fore: they feed the silkworm, and conduct most of the delicate and important operations connected with it. No labour, however strenuous, comes

amiss to them, and it is not surprising, therefore, that these useful and inexpensive helpers enjoy far more freedom and consideration than usually fall to the lot of their sisters in the homes of the more conservative "upper classes." The wife of the farmer shares not only the labours of her husband but also his counsels, and it is often she who keeps the purse and really rules the house. A significant result of all this is found in the fact that divorce is far less common in rural than in urban Japan. What would be the loss to the silk industry were it not for the woman's share in it, one can scarcely conceive. Nearly two million families, representing perhaps eight million people, are engaged in the task of rearing the *O ko sama*, "The honourable little gentleman," as this supremely precious worm is styled. Their homes are found mainly in the mountain districts of central Japan, and are better and bigger than those of the average peasantry. They consist usually of two storeys, being also provided with the peculiar chimneys called for by the heating arrangements needed for the worm's well-being. No toil is so exacting as that which he involves. In early childhood he has to be fed seven or eight times a day, and in August his nurses only get some three or four hours' rest in the whole twenty-four. The night-long noise of the nibbling of these countless myriads in some farmer's homestead is as the scratching of ten thousand pens in a great University examination hall.

As it is believed that any harsh, noisy, ill-mannered behaviour in his presence at this period will seriously affect the quality of the silk he is to produce, we can realize what an important disciplinary influence he must exert on the character of those over whom he holds such despotic sway! An interesting question of entomological psychology seems here to be suggested.

At the old feudal town of Ueda, in the province of Shinshū, on the outskirts of the foothills of the northern Japanese Alps, I used often to see the remarkable College of Sericulture where the most up-to-date methods are in vogue. The students keep themselves fit for their exacting work by a rigorous course of strenuous exercise, fencing, wrestling, and especially of weekly mountain climbs. The Principal of the College quoted to a friend of mine* as ***his*** motto in this respect the dictum of President Roosevelt—"Sweat and be saved." This enterprising reformer had a colleague who discovered a profitable method of utilizing the pupæ of the defunct silkworms in place of relegating them to the usual manure heap. He turned them into what he entitled "beef-tea"! This he was able to produce at one-fifteenth of the cost of the "foreign style" article. His chief, after experimenting with it for a fortnight, declared he had never felt so perky in all his life.

There can be, I feel sure, no clearer proof of the hold of Nature on the imagination of man than the popular festivals which are the outcome of his views on those of her operations which most intimately affect his

* 'The Foundations of Japan' (J. W. Robertson-Scott).

welfare and most unremittingly exact his toil. In Japan we find that all the most ancient and widely observed are those of the peasant folk. They are celebrated with a zest and wholeheartedness that afford a standing witness to the paramount importance of agriculture to the life of the whole nation.

One of the earliest festivals in the year is that of *Inari-sama*, the "Goddess of Food," on behalf of a fruitful rice harvest. In view of the immense importance of that harvest to the country it is not unnatural that this divinity should be held in the highest honour. Papers stamped with the picture of a fox are found above cottage doors throughout Japan, and are regarded as charms of exceptional potency. This animal is credited with powers of bewitchment, and belief in *Kitsune-tsuki*, "Fox possession," is widespread and real.

In the rural districts nearly every swift-flowing river has its own presiding divinity, in whose honour services are periodically held in order to avert those likely inundations of early autumn that prove so disastrous to the ripening crops. In connection with the silk industry, the chief celebration is that of the "God of Hailstones," when in May the farmer resorts to the village shrine to petition protection of his precious mulberry trees from the dreaded scourge. These trees are believed to be always immune from lightning, and a man caught in the open in a thunderstorm has only to call out *Kuwabara, i.e.* "I am in a mulberry grove!" to ensure the prophylactic benefits of the tree in question.

The rice harvest has twin festivals of its own, in mid-October and late November respectively. At the one the "firstfruits" are offered at the village shrines, and at the other the Emperor formally tastes the first new rice that has just been presented at the most sacred of all the altars of the land, those of the Imperial Ancestors at Ise. One of the most highly popular festivals with the peasantry at large, however, is that of *Ebisu*, the God of hard work and of wealth. It is kept with twofold energy, not only because everybody wants to be rich, but because it is felt that the being who can bestow prosperity should be courted with every token of rejoicing. At this celebration, in the province of Kishu, in central Japan, when the procession bearing the usual offerings approaches the village shrine, the *Son-chō*, or "Headman," who acts as a sort of Master of Ceremonies, calls out in a loud voice, "According to our annual custom, let us all now laugh"! To this exhortation a hearty response is given. The explanation is that Ebisu is the only one of the eight million Shintō divinities who has not repaired to the great Shintō shrine at Idzumo on the usual annual holiday. The reason for this is, that as he is deaf he never hears the invitation. Consequently his worshippers seek to cheer him up in his loneliness by their own infectious merriment. It appears to them natural that such an act must be pleasing to the object of their devotions—"Let us come before His presence with thanksgiving, and show ourselves glad in Him with psalms."

The deeply indented coastline of Japan shows a ratio of 1 mile of coast to 9 square miles of land; that of the British Isles is about 1 mile of coast to 13 square miles of land. The Japanese shores abound in fish of every kind, and the fishermen of the north work one of the richest deep-sea fisheries of the world and provide the nation with one of its most valued supplies of food. It is from these men, inured to hardship and peril from an early age, that the Japanese navy derives its finest material, particularly for the submarine service. The rigours and harsh confinement of this appear to affect them less than the same ratings in any other navy. It is probable that, other things being equal, a Japanese submarine crew could remain at sea nearly thirty per cent. longer than any possible rivals.

A severe test of the nerve and endurance of these fisher-folk is imposed by the dreadful so-called "tidal" waves, which I have known to take toll of 27,000 lives on a single occasion. They usually sweep in without any warning, and I have seen fishing-boats left by the receding waters high and dry in the tops of pine trees on the devastated shore. In one case, a man walking on the sands sought safety from the threatening wave by scrambling into one of a long line of boats that barred his way. This was swept forward and finally left resting on the roof of a solidly built dwelling further inland, its passenger, though exceedingly surprised, still unharmed!

On another occasion an old farmer, high up on a terraced hillside, during the harvesting of his precious rice crop, chanced to turn and look out seawards, when a long dark line sweeping in from the horizon told of forthcoming disaster. There was not time to descend to warn and to bring up the villagers from below, but he adopted a surer way, for in a swift moment he had fired the sheaves already gathered, and the resulting columns of thick and dusky smoke attracted all eyes and brought every soul up to the spot. Their homes a few minutes later no longer existed, but their own safety, purchased at so great a sacrifice, later found a fitting memorial in the erection of a shrine in honour of the old Headman, who therein enjoyed the unique distinction of being worshipped, during his own actual lifetime, as their special tutelary divinity!

The abundant and varied hot mineral springs with their soothing and healing waters form a most important feature in the social life of the cleanest nation in the world. Their enjoyment is the common possession and passion of all classes over the whole country, and has been dear and familiar to them since before the dawn of their history. Most of them are found at the foot or on the flanks of great volcanoes, with whose hidden fires they claim kinship, from sub-arctic Hokkaidō in the north to semi-tropical Satsuma in the south.

In the *Kojiki*, "Records of Ancient Matters," the earliest extant literature in the language (published in 712 A.D.), we see the Emperor Kimmei sent by his medical advisers to the *onsen* ("hot spring") of

Arima (some 8 miles distant from the great modern seaport of Kōbe) before the end of the sixth century. Its healing virtues are witnessed by one of the oldest proverbs of Japan: "When you are ill, go either to the doctor or to the *onsen* of Arima; but if you are love-sick neither the doctor nor even the spring can cure you."

More than eleven hundred of the most important spas are registered in the Hygienic Laboratory of Tokyo, of which nearly a thousand are thermal (*i.e.* above 98°), and it is these that attract the country folk and town dwellers alike in the summer months by their hundreds of thousands. Most come for the benefit of the bathing, but many to kill time pleasantly in congenial company and in the most charming surroundings imaginable.

In some sequestered valley the bath may be merely a hole scooped out of the warm earth adjacent to the source. Occasionally the spring forces its way through adamantine rocks rising in mid-stream, or high above the torrent bank. Some I have visited where a man will spend practically a whole month, nay, a winter at a time, in water just below blood heat, safeguarding himself by placing a boulder from the neighbouring stream upon his knees before he retires as a precaution against "turning turtle" and drowning in his sleep. This spring has been in the hands of the family of the present owner for over three hundred years. In yet another the bathers are only able to endure the ordeal, which is repeated five times a day, for a space of three minutes at a time. The temperature is nearly 130°, and the water is only entered when courage has been screwed up to an effective pitch by the blasts of a trumpet or the beating of a drum. The bathers parboil in companies of fifty for mutual encouragement.

Whatever else may be alleged as to a certain fancied strain of fickleness in the Japanese character (perhaps partly due to the violent and varied changes in the natural phenomena influencing them at every turn of life), it is quite certain that their national love for getting into hot water has never grown cold.

But it is the mountains of Japan that constitute its most striking feature and have exercised the most marked influence on the character of its inhabitants. They occupy more than three-quarters of the total area of the country, and form the chief part of nearly every view. Nowhere do we find that intense love of freedom and independence always associated with mountain peoples so strongly marked as among the Japanese, for to those characteristics we have to add an intensely nationalistic spirit, inborn in an island people whose shores no conqueror has trod, since it became a nation. Just as ancient Greece was not, in a political sense, one single united homogeneous country, but rather an association of independent states, often quite small but very jealous of their own individuality, so has it been, to a great extent, with the Japan of feudal times. Each separate clan, under its own Daimyō, dwelt in its own

province, in many instances almost entirely cut off from its neighbours by high mountain barriers which not only made intercommunication difficult, but bred a strong disinclination for centralized government. It was in the seclusion of such inaccessible forest-clad hills and wild torrent valleys that the fierce family feuds and internecine strife persisted during many centuries of intrigue and bloodshed, and left their mark in the warlike character of a really peace-loving people. It has been the hard conditions of existence for the majority of the Japanese in their mountain homes that have bred habits of frugality, endurance, and self-reliance to an extraordinary degree. These features are seen in their extreme degree in the case of the inhabitants of Satsuma, the southernmost province of Japan proper. Both in remoteness and inaccessibility of geographical position, and also in character, they much resemble ancient Sparta with its Lacedaemonians. Hemmed in on north and east by mountains, and on south and west by sea, they are not only somewhat stern, dour, unliterary, and harsh to strangers, but exhibit an extraordinary degree of exclusiveness and individuality of character. They held out to the last against the unification of the country under Hideyoshi in the latter part of the sixteenth century, and three hundred years later against the reforms that marked the disappearance of the feudal system, when all the other clans had accepted the inevitable. From the men of Satsuma Japan has derived the most famous leaders in its modern navy.

The mountains of Japan have always exercised a marked influence on the outlook of the Japanese mind. From the earliest times we see the people eager to seize upon any striking peak and to connect it with a legend or a shrine, just as did the old Greeks whom, in these respects, they so much resemble. Nearly every mountain summit has its own guardian divinity, worshipped at some appropriate spot, and woe betide the careless or the contemptuous intruder on those sacred precincts at unpropitious seasons or in unhallowed ways!

I speak feelingly. Three summers running was I warned off one of the most splendid peaks in the innermost province of the empire because, I was assured, the *genius loci* would resent the intruding foot of a foreigner in his forbidden solitudes. Once, on Hodakayama, I was attacked by embodied spirits in the form of wasps for having, as I was told, defiled the sacred mountain with the same alien hoof. Yet again was I thrice chased away by typhoons from the top of Fuji because Mrs. Weston had ventured—of course unknown to me—to commit the unpardonable sacrilege of removing a fragment of its loftiest point. And, finally, I became the object of the ultimate vengeance of the goddess because I had ventured to climb the snow-clad peak at a season when that divinity, as I was reminded by the policemen and the village elders at the foot, was not at home to receive visitors! On this occasion opinion was subsequently divided as to whether I died of

THE NORTHERN RIDGE OF YARIGATAKE

THE CRATER OF FUJI-SAN

YAKEDAKE FROM THE SUMMIT OF YARIGATAKE

DISINTEGRATION OF THE BUND ON THE CREEK BELOW CAMP HILL BRIDGE, YOKOHAMA

THE WHITE RAILING ON THE BLUFF AT YOKOHAMA, SUNK BELOW THE CONCRETE RETAINING WALL

starvation or was overwhelmed by an avalanche; my nationality, also, the Japanese newspapers stated, was uncertain, "But it is surmised that he was British, for the reason that the people of that nation like to do what is disagreeable to them and glory in their vigour"!

We find that those aspects of Nature which in Japan so strongly affect the character of man comprise an amazing variety of savage grandeur, appalling destructiveness, and of almost heavenly beauty. But none of the outbursts so completely impresses man with the fact of his own helplessness as the shock of the earthquake, from which the Japanese have suffered more than any people on Earth. No wisdom of man can foretell it, nor can his skill and his strength forestall or prevent its onset. The first warnings, however, quite imperceptible to human beings, are usually detected by the lower animals. Dogs will bark, horses grow restive, and pheasants are heard to scream.* The severest shock of modern times, previous to 1 September 1923, was that of 28 October 1891, at the beginning of my stay in Japan. It is usually known as the Gifu earthquake, from the town of that name, two-thirds of the way westwards from Tokyo to Kōbe, which became the centre of the devastated region. The phenomena associated with it have been in many respects reproduced in the recent disturbance, though the destruction of life and property was less because the country was far less thickly populated, and the seismic centre lay in the granite mountain mass to the north of the Gifu plain, whereas the centre of the Tokyo earthquake seems to have been situated in the neighbourhood of the volcanic island of Ōshima, 65 miles south-west in the Bay of Sagami. Here a tract of the ocean bed, 18 miles by 5 miles, was depressed to a considerable depth, while marked proofs of the already known gradual elevation of that part of the eastern coast of Japan were also observed. Similarly, in the Gifu earthquake region which I traversed to its centre in the Neodani valley, I found that a large area of the valley floor had sunk to a depth of nearly 50 feet perfectly horizontally. The faulting of which this was a part was found to continue nearly 40 miles. Near the entrance of the valley, whole hillsides had been tilted forward in such a way as to disclose distant prospects of far-off mountain ridges formerly invisible. At the foot of one of these disturbed hills I saw a cluster of heavily thatched cottages of the peasantry which had sunk into the earth in a moment of time. Apparently the ground had suddenly become as it were fluid, so that the heavy steep roofs sank down like gigantic candle extinguishers which perforated the soil and crushed to death the unfortunate inmates beneath. During this earthquake, as far off as Tokyo 200 miles away, the ground moved in long easy undulations, as of a raft on an ocean

* After one great cataclysm it was gravely pointed out by some wiseacres that people *ought* to have been on the watch, because in the district where it occurred, which is famous for its persimmons, the seeds of that delectable fruit had that year been growing upside down!

swell, but near the centre the waves were short and rapid; towns and villages were overthrown, chasms opened in the earth, mud volcanoes were formed, and the strongest engineering structures were ruined. The most severely shaken area, in many parts of which such buildings were completely destroyed, covered 4200 square miles.

When I passed through the old castle town of Ōgaki, I found that out of its eight thousand houses only about thirty remained standing. At the time of the first shock, about 6.15 a.m., some four hundred people were worshipping in the great Buddhist temple. The heavy tiled roof crashed down, and in a moment the great gathering was overwhelmed. Outside there were seen four hundred pairs of shoes waiting for owners who never returned to claim them.

It was noticed that, as in the case of the Tokyo earthquake, much of the destruction took place on river-banks, and on the edges of scarps or cliffs, where, in its forward swing the free face, being unsupported on that side, is shot forward by its own momentum, just as is the last of a series of railway waggons when a locomotive bumps against the other end. In this way, at Biwajima, near Nagoya, a bamboo grove with a fringe of pine trees was pushed back a distance of 60 feet without a single tree falling out of the perpendicular.

Observation showed that buildings on soft ground such as the Gifu plain, a bed of alluvium, always suffer more than those on hard. This fact was also largely responsible for so much of the damage wrought lately in Yokohama and Tokyo, much of which, in both cities, was built on soft ground comparatively recently reclaimed from the sea. It should be remembered, however, that most of the wholesale destruction in these two places was mainly due to the fires of various kinds whose flames, fanned by a fierce typhoon, turned them into little better than furnaces. At the Specie Bank in Yokohama some three thousand perished, and in the great enclosed space in Tokyo, near Honjō, over thirty-two thousand met a similar fate in an incredibly short space of time!

With regard to the ascertained results of the recent earthquake it is a little difficult to speak with absolute confidence. It is however now officially stated that a subsidence has taken place of the bed of the Pacific between the volcanic island of Ōshima and the coast in the neighbourhood of Kamakura. This subsidence is regarded as the primary cause of the earthquake itself. The gradual elevation of that part of the coast which has been proceeding for many years has now been much accentuated, notably near the great naval base of Yokosuka, which was the scene of great destruction to ships, buildings, and personnel. Rumours of the disappearance of Ōshima and of the lovely islet of Enoshima are now known to be false.

As usual, Fuji-san is reported to have suffered severely, the summit sinking in, new craters opening up, and various signs of threatened activity appearing. But investigation has revealed practically nothing

beyond what either one has been familiar with from many ascents of the mountain during the last thirty years, or which could not be explained by the normal wear and tear due to the excessive weathering which is such a well-known feature of this extraordinary peak. As it rises in one continuous sweep from the shores of the Pacific, in splendid isolation and overtopping all other heights by a thousand feet, its position makes it the natural target of the blasts of every typhoon that smites those shores with such destructive fury.

It was remarked, after the Gifu earthquake, by medical investigators, that the results of the intense nervous excitement were shown in the form of tetanus, spinal and other troubles, rather than in any general mental paralysis. The fact that the Japanese are a less nervous and excitable people than Europeans is doubtless due to their being so long familiar with those convulsions of Nature that constitute the nation's greatest terrors. The constant destruction of that which ordinary peoples are accustomed to regard as stable and permanent is bound to leave its abiding mark on the Japanese character. While the softer and more gracious operations of Nature serve to render them lively, artistic, and impressionable, the constant necessity for repairing the ravages wrought by the violent cataclysms seem rather to make them stoical, persevering, and fatalistic.

Some time ago, in an article on the scenery of his country, a well-known Japanese writer uttered the following sentiments: "Were Japan wholly a granite country, her scenery, as well as the experience of her people, would have been much more monotonous; but her numerous volcanoes and the constant movement of the Earth make life intense and interesting."

Before the paper the PRESIDENT (the EARL OF RONALDSHAY) said: Our lecturer this evening, Mr. Walter Weston, well known to the Fellows of this Society as an authority upon Japan, has chosen as his subject "The Influence of Nature on Japanese Character." It is generally agreed, I suppose, that Nature plays a considerable part in establishing the character of a people. Many of the characteristics of the Northern races of Europe, for example, may be traced back to the influence which has been exercised upon those races by Nature. The rigours of climate, the fierce onslaught of the sea—these things have acted as a challenge to man in those countries. And man has accepted the challenge and has established his supremacy over Nature. Hence the sturdiness of his character, his sternness and strength and his self-confidence. By way of contrast take some rich, warm country like the valley of the Ganges in India, for example; a country where Nature extends an invitation rather than a challenge to man; where warmth and fertility obviate the necessity of hard toil to secure for man either shelter or sustenance. In such a country you find the characteristics of the people entirely different. You find a leisureliness rather than a briskness in all their activities. You find them, as a rule, a contemplative people, given to thought rather than to action; prone to speculative abstract thought. In Japan Nature displays herself in both these aspects. You have the smiling kindly beauty of semi-tropical lands. But

Nature here also has spasms of fierce wrath, when the earth quakes and when the seas fling themselves upon the land in devastating tidal waves. One would expect, then, to find the character of the Japanese a complex mixture, combining the reserve and the sturdiness of the Northern races with the smiling and graceful kindness of the peoples of more favoured climates. Such indeed, I think, is the case; and unless I am much mistaken the complex character of the Japanese will become apparent as Mr. Weston unfolds his tale—a tale which I now have much pleasure in asking him to give us.

The Rev. Walter Weston then read the paper printed above.

The PRESIDENT: His Excellency the Japanese Ambassador is present this evening, and I am sure you will be delighted to hear a word from him.

His Excellency Baron HAYASHI (Japanese Ambassador): You have listened to a most charming and fascinating lecture, beautifully illustrated. I think that Mr. Weston has brought before us to-night every type of famous mountain in Japan: every district swept by fierce tidal waves: all the hot springs—everything. He has really left nothing for me to add, but by way of, as it were, spoiling his lecture, may I say this: he has told you of all the good qualities of the Japanese, and he says that they are all the effect of Nature. If in future Japan deteriorates, or becomes disagreeable in any way, then you will know the cause—it will be the effect of Nature!

The PRESIDENT: The lecturer has indeed travelled over a great deal of ground, and the last part of his lecture must, I think, have awakened in our hearts once more feelings of the most profound sympathy for the people of Japan, who have again been stricken by so terrible a natural calamity. We can assure His Excellency that we do sympathize very profoundly with him and with his fellow-countrymen in this great trial. Earlier in his lecture Mr. Weston told us that there were no people that he knew of who were so appreciative of natural beauty as the Japanese, and there will be few, I think, who have travelled in that country who will not be in complete agreement with him in that statement. But it would have been interesting if he had endeavoured to explain to us what was the cause of this deep appreciation of natural beauty on the part of the Japanese. I have tried to think out myself sometimes what the reason for it is, and I believe that certainly one of the explanations is to be found in the fact that the great religion which the people of Japan practise, the religion of Buddha, is one which compels men greatly towards meditation. In my remarks prior to the lecture I spoke of the valley of the Ganges in India, and I suggested that man's environment in that part of the world is conducive to meditation. It was in the valley of the Ganges that Buddhism was born, and Buddhism travelled thence through China to Japan. As I listened to Mr. Weston I felt all the more convinced that this might be, at any rate, one of the explanations as to the reason why the people of Japan possessed this extraordinaty faculty for appreciating natural beauty, for he told us that in the course of their great national holidays and ceremonies the thing that struck him more than any other about their demeanour was the way in which they sat, or stood, and gazed at the scenery around them. They were, in fact, absorbed in meditation. There is much more in Mr. Weston's lecture that provides food for thought, and we shall look forward to going over it once more when it appears in the pages of our *Journal*. In the meantime, let me, on your behalf, extend to him our most grateful thanks for the admirable lecture, beautifully illustrated by so splendid a series of views.

CONTRIBUTIONS TO THE PHYSIOGRAPHY AND GEOLOGY OF THE SOUTH-EAST COAST OF BRITISH NORTH BORNEO

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Map following page 176.

FROM February 1913 to April 1914 the writer was in charge of the field investigations of the area discussed in this paper. He was assisted by three other geologists: Dr. F. Spiegelhalter, Dr. K. Stamm, and Mr. H. Jezler (mining engineer).

Messrs. Stamm and Jezler surveyed the Darvel Bay region and Dent Peninsula. The writer and Dr. Spiegelhalter surveyed the Cowie Harbour region and Simporna Peninsula, with the exception of the small Tertiary outcrop on Panajas island, off Sibatik, examined by Mr. Jezler, and the river Siagau, visited by Mr. Stamm. We had our headquarters on Sibatik island. The observations along the river Kinebatangan, as far up as Penunga and Mangkoago, are due to the writer, while to those around Sandakan Bay all of us contributed. Mr. Jezler went up the Sugut, Tungud, and Labuk rivers. Unfortunately I was unable to make use of the observations he made on these trips, the samples gathered having never reached Europe on account of the restrictions due to the war. Most of the material gathered by Mr. Stamm and Mr. Jezler from Darvel Bay region and Dent Peninsula has been examined by the writer. Dr. Stamm's account has already been published separately by Dr. Wanner (see Bibliography, No. 10).

To Dr. A. Tobler, of Basel, the well-known authority on East Indian geology, are due the determinations of the fossils and stratigraphical horizons mentioned in this paper. We wish here to take the opportunity to thank him for his valuable contribution.

I am indebted to the Board of Directors of the Nederland'sche Koloniale Petroleummaatschappy for their kindness in granting me permission to publish the results of the investigations made on the Company's behalf.

We owe a deep debt of gratitude to the British residents, officials and others, whose hospitality and help never failed us, and I shall always remember with pleasure and gratefulness our association with the natives of this remote country, who cheerfully shared our jungle life.

Physiography of the Cowie Harbour region and Simporna Peninsula.

The Cowie Harbour region has been studied in greater detail than the rest of the country. The coast-lines on the accompanying maps have been taken over almost unchanged from the Admiralty charts; the boundary between Dutch and British North Borneo, as well as the rivers of the Dutch territory, are from the map published by the Boundary Commission (6).

The following rivers with their more important tributaries have been surveyed by us: * the Sarudong-Tambalunan, Silimpopon, Kalabakang, Blantian, Masmas, Marutai, Tawao, and Klumpang-Balikang. As far as these rivers are navigable with native praws, distances were measured with line and the bearings taken with a compass. Higher up, the distances were estimated and the number of paces registered. Many bearings have been taken from prominent hills; the heights were calculated from aneroid readings. Such maps are of course far from accurate, but they nevertheless give a very fair idea of a hitherto very little-known country, on which only Stigand (5) has published a valuable note and a sketch-map, covering a small part of the region surveyed by us.

The navigation on all the rivers mentioned is handicapped by many rapids. This is especially the case with the river Sarudong-Tambalunan. Rapids in firm rock are called by the natives "giram," those due to loose boulders "grogu." Both forms are frequently met with in all the rivers.

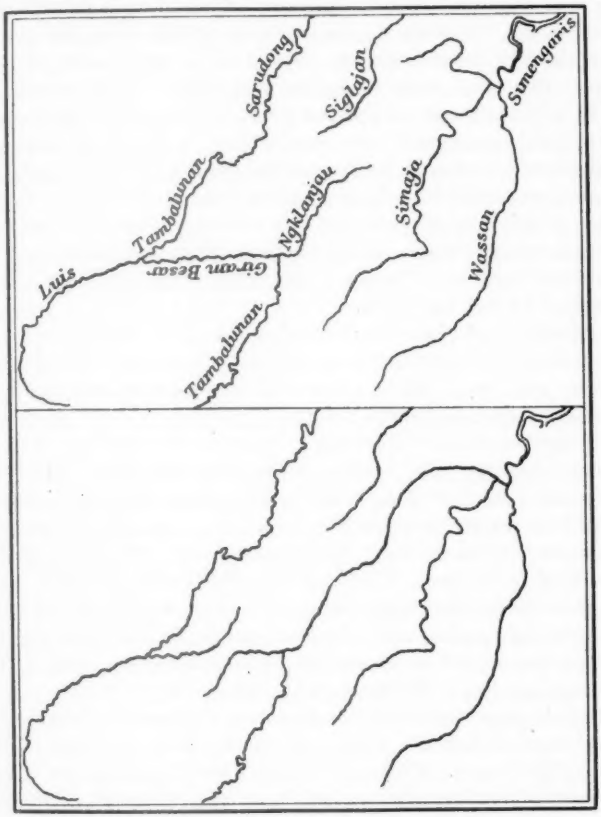
Let us begin our description with the river system nearest the Dutch boundary: the Sarudong-Tambalunan. In its lower course the river is called Sarudong, the upper course is called Tambalunan or Tamunan. The name changes at the mouth of a very small left-bank tributary, called Sarudong, like the main river. The main tributaries are: from the left side (the natives would call it right, always facing the rivers upstream), Sireun, with its mouth just above Giram Mariang, and Luis, where the Tambalunan turns sharply towards the south. So far the right-hand tributaries are merely small brooks. Along the upper course of the Tambalunan the tributaries from the left side are less important, except perhaps the Pirit, Sbaga, Lapolapot, and the Tiautiau, while we meet on the right several rivers of some importance, like the Ngklanjau, Susui, Sapah, Aya, and Sapang. Near its source, the Tambalunan splits into two brooks of equal size, called Aliau and Lumat. None of these tributaries are navigable. The Sarudong-Tambalunan itself is navigable as high up as Batu Meja (a table-shaped rock in the middle of the river accounts for this name), some 2 miles below Kwala † Luis. The height of the river-bed is here some 80 metres above sea-level.

The most remarkable feature of the Tambalunan is the sharp break of its normally north-west–south-east trend into a northern one, between the tributaries Ngklanjau and Luis. The valley has here the aspect of a tremendous and impracticable gorge, called Giram Besar ‡. In a relatively short distance, the river falls here nearly 200 metres. From Kwala Ngklanjau upwards, the Tambalunan is again navigable. To reach Kwala Ngklanjau one has to follow a native path connecting Kwala Sulak with Kwala Ngklanjau, climbing over easy hills some

* The pronunciation of the names of rivers and hills is liable to changes, and the Dajaks, Tidungs, and Dussuns have their own way of spelling them. The indeterminate vowel, very common in these names, is written *a*.

† Kwala = mouth of a river. ‡ Big gorge.

500 metres high. The higher Tambalunan valley not being inhabited, praws are not available for a further trip, and they must be built by the exploring party. There is plenty of timber suitable for this purpose in the neighbourhood. With the exception of the already mentioned impracticable Giram Besar, the wildest country met with is that of the Luis valley. From its mouth up to the tributary Lalang, for a distance of about 6 miles, the difference of level of the river-bed is more than



400 metres. There are no tracks of any game whatever, and we never could catch a fish. Next to it comes the Susui valley, with high waterfalls in its middle part. The water of some of the rivers has a pronounced reddish or brown colour. This is the case when the water drains a region lying above 1000 metres; it must be due to a peculiar form of vegetation, called by the natives "Krangassan." These coloured waters contain probably much organic acid in solution.

We have already mentioned the characteristic break of direction in the course of the Tambalunan and the existence of a wild gorge between the navigable and thus more levelled parts of the river. Taking in consideration the very low level of the watershed between Ngklanjau and Siglajan—it might be between 200 and 300 metres—we come to the conclusion that we have to deal here with a recent capture. The sketches show the conditions before and after the capture.

The next important river to the north of Sarudong-Tambalunan is the Kalabakang. Between the lower course of both rivers lies a small valley, drained by the Silimpopon. The Kalabakang receives only two important tributaries, both navigable with small native praws, the Siagau from the left, and the Salimut from the right side. In its upper course the Kalabakang splits into several brooks, the Kokuluan, Inapayat, and Tyinayu being left, and the Yan and Kalobang right bank tributaries. The Kalabakang itself is navigable without trouble as far up as Kwala Salimut. A little higher up begins with the Giram Basai * a series of Girams and Grogus, which render progress, if not impossible, at least very slow and tiresome. The Kalobang valley recalls the Susui valley, on account of its high waterfalls.

The general trend of the rivers mentioned so far is north-west–south-east. It is in close connection with the geological structure of the country. The valleys are longitudinal; the upper Tambalunan is monoclinal, while the Silimpopon is synclinal.

The following rivers: Blantian, Masmas, Marutai and Tawao, come from the north. The Blantian is the most important. The point where it receives the river Bang from the left and the Paninsau from the right might be reached with small praws. Both the Masmas and the Marutai are navigable for short distances only, and with much trouble on account of fallen trees. The aspect of the Tawao valley is quite different from that of the others already dealt with, and this is due to its draining a volcanic region, while the others are cut in sedimentary rocks.

We have not visited the rivers Apas and Balung, but went up the river Klumpang, called Balikang in its lower course, to its sources. This is the only important river of the Simporna Peninsula; it is navigable for several days, though not always without trouble, on account of the Girams and the Grogus. From the sources of the Klumpang, the village on the lower Marutai can be reached in an easy day's trip, following well-beaten elephant tracks.

Orography.

The Cowie Harbour region and the Simporna Peninsula are a markedly hilly country, with the exception of a coastal belt of mangrove and nippa swamps and the dry plateaux around Tawao and Simporna, including Bum Bum island. The height of the most prominent hills is

* Basai is the Tidung pronunciation of the Malay word *besar*, which means "big."

rather uniform and hardly exceeds 1300 metres. The slopes of the hills are generally very steep, and thick jungle covers the whole country.

The watershed between the lower Sarudong-Tambalunan valley and the Simengaris river system marks the boundary between Dutch and British North Borneo. It is low, flat, and ill defined, and its shape is very capricious. The upper Tambalunan valley, above the Giram Besar, is separated from the Apat and Uluh * Sibuku by a lofty mountain range, reaching 1300 metres. Maliat † is one of the prominent summits of this range. From Uluh Tambalunan one can cross over to the Sambilan, a tributary of the Koamut. The watershed is here only 730 metres high. Another prominent mountain of more massive and rounded shape separates the Luis and Tambalunan valleys. We called it Gunong ‡ Damar (it had no native name), because the Dayaks brought from here heavy loads of damar putih and guttapercha. Gunong Damar is 1300 metres high and can best be reached from Kwala Luis. The range between Saradong-Luis and Kalabakang is cut into two separate ridges by the deep notch of the Salimut-Sireun depression which does not exceed 450 metres. Kapilit is the name of the eastern ridge (Mount Kindersley of the map of British North Borneo ?). The Silimpopon, Sireun, and Salimut rise from here. It can easily be reached from the Silimpopon coal-mines, with more difficulty from the Uluh Salimut. Blangkas (Mount Creagh ?) and Anjeranjer (Mount Flint ?) are the very prominent tops on the north-west side of the Salimut depression. They are both over 1000 metres high. Blangkas can be climbed from Kwala Aja on the Tambalunan; the distance is short, but the slope is steep. We have not visited the Gunong Anyeranyer.

In the north-west part of the region surveyed, the Uluh Kalabakang, the height of the hills diminishes gradually and the country has a more peneplained character. This is especially the case as regards the watershed between Siagau, a left tributary of the Kalabakang, and Imbak-Biudan, tributaries of the Koamut; it is scarcely 500 metres high. Tambuku §, a 1000-metre peak seen from afar, is the most characteristic elevation of the region drained by the Blantian. The best starting-point to reach Gunong Tambuku from the Blantian valley lies a little above Kwala Bang and below Kwala Paninsau. The climbing of the rather steep topmost peak is done crawling through and over thick brushwood and with the help of tree roots. The view from this isolated hilltop over an immense rolling jungle sea is overwhelming. The view from the other hills mentioned above is rather disappointing. In order to see anything one has to climb up a tree, but even then one gets only glimpses of a half-hidden panorama. Above the 1000-metre level trees are not as high as in the lowlands.

* Uluh = upper course. † Maliat = the visible. ‡ Gunong = mountain.

§ The natives call tambuku a message which they send to their kinsmen in the form of a thin rattan rod, provided with knots.

On the Simporna Peninsula there are no prominent hills east and north of the river Klumpang. West and south of it rises the most imposing ridge of the whole east coast. Tawao range, as we call it, is drained by the rivers Tawao, Apat, and Balung and by the right-bank tributaries of the Klumpang. The highest summits, which we had no opportunity to visit, are more than 1300 metres high. The forms are massive and rigid; some of the lower heights are table-shaped and the landscape is composed of an extinct volcanic region. Sigalong range, to the east of the Klumpang, also of volcanic origin, is much lower than the former.

The panoramic view, taken from the top of a 150-feet tree behind our headquarters on Sibatik island and from Tanjung Lalang (grassy point), gives an idea of what the country described looks like. Gunong Blangkas is not visible from here, it is hidden behind the Kapilit. Both mountains are seen from Tawao, very close together.

The Population.

British North Borneo, as a whole, is very sparsely populated, and this is especially the case of its south-east coast. Tawao, the residency of a district officer, is a small town with a few Chinese shops. Simporna is much smaller. On the lower course of the Sarudong, Kalabakang, and Marutai, and on the small rocky island in the delta of the Klumpang, are small "Kampongs." The men of Sarudong and Kalabakang Kampong are Tidungs, those of Marutai Kampong Banyers, both immigrants from Dutch Borneo. The latter are a very troublesome and ever-fighting crowd at home, but proved to be the best of jungle men, besides the Dayaks, who come to this country occasionally, in search of damar and wild rubber. Higher up on the Sarudong-Tambalunan and on the Kalabakang live a few natives, called Dussuns by the Tidungs, though they show more affinity to the Tangaras or Muruts. They call themselves Uluh Nassak. Their settlements are marked on the map where we found them, but since they are a nomadic tribe, they shift their houses every two or three years. Some make excellent jungle and river men, but most of them are unable to stand a long effort and will break down very soon. Lack of food and inter-marriage are no cure for anæmia and consumption and, maybe, other infirmities. They are all in debt to the Chinese storekeeper, whose goods they highly appreciate. Cash is an unknown and superfluous commodity in their trade, and not even cared for by the Chinaman, who contents himself with heavy loads of damar and rubber in exchange for trifling petty wares and sweetmeats. The advantage of the bargain is not always on the side of the kind-hearted native.

The East Coast between Sandakan and Lahad Datu.

Two very important rivers, the Sigama and the Kinebatangan, drain this country, besides a great number of small ones. The first rapids

met with on the Sigama are above the right-bank tributary Bole. A fact to note is, that the Sigama receives only small tributaries on its right side and none whatever from its left. It has an exaggerated length in proportion to its volume. The Sigama once flowed into the sea at Lahad Datu, and is actually separated from the sea in this region by a strip of flat land only 6 miles wide, while its mouth is some 60 miles farther to the north-east. This accounts for its exaggerated length. We do not have to deal here with a capture. The change of its course and the shifting of its mouth towards the north, abandoning Darvel Bay, must be explained by a slight uplift of the Darvel Bay region, compensated probably by a slight downthrow of the north side of Dent peninsula. Stigand has already drawn attention to similar recent movements, observed at Sibuku Bay (5). The springs of the Sigama rise from the same region as those of the Blantian, Masmas, Marutai, Klumpang, and Tyinkayu, which thus proves to be an important hydrographic centre.

The Darvel Bay region, west of Lahad Datu and south of the Sigama river, is very hilly; the shore is generally rocky, and so are the many islands of Darvel Bay. The height of the hills seldom exceeds a few hundred metres. Dent peninsula is mostly lowland with extensive swamps, especially on its south-east corner and along the northern shore. The swamps are fringed and separated from the sea by a narrow belt of dunes. Between the rivers Silibukan and Tunku rises the Tunku range. It recalls the Tawao range on Simporna peninsula on a smaller scale and is also of a similar volcanic origin. The extremity of Dent peninsula, near Dent haven, is formed by low hills, not over 150 metres high.

The river Kinebatangan is the main stream, not only of the east coast, but of the whole territory of British North Borneo. During the wet season small launches go as far up as Kwala Koamut, a very important right-bank tributary. We went up the Kinebatangan to Penunga and Mangkoago, situated at the very heart of British North Borneo. From here upwards the main branch of the river is called Meliau. The most important tributaries are: From the north—Menanggul, Lukan, Tangkulap, Kramak, and Mangkoago; from the south—Tamegang, Lamak, Koamut, Sinuah, Penunga, and Melikop. The country drained is a lowland, with a few scattered low hills rising here and there on the lower course of the river and with a slightly more pronounced hilly character on its upper course. A marked depression runs here across the whole island over to the west coast. The telegraph line, connecting Sandakan and Lahad Datu with the west coast, has taken advantage of it.

Sandakan bay is a depression below sea-level, due perhaps to a fault. Several small rivers converge towards it. The islands in the bay are rocky, the shore, except near Sandakan, swampy. Sandakan peninsula is a plateau with small scattered hills. Some prominent hills exist in

the region drained by the middle course of the Labuk and Sugut. Towards the interior level ground prevails, and a plain of remarkable size extends towards the foothills of the Kinebalu, the highest mountain of the whole island of Borneo (4000 metres).

Geology.

So far very little has been published on the geology of the east coast of British North Borneo. A list of publications, concerning the geology of this country, is given at the end of this paper, though we propose to deal here only with our own observations and those of our assistants.

The following are the formations:—(A) Recent and Quaternary deposits: Swamps, dunes, alluvial deposits, and coral reefs. (B) Tertiary formation: Shales, sandstones, conglomerates, limestones, and lignites. (C) Tertiary volcanic rocks: Andesite, trachite, labradorite. (D) Danau formation: Sandstones, shales, conglomerates, breccias, radiolarite, ophiolite, granite, and metamorphic schists; mainly pre-Tertiary, including possibly lowest Tertiary.

A. Recent and Quaternary deposits.

They form a belt of varying width along the shore, except in those few places where older formations extend directly towards the sea. At the extremities of Simporna and Dent peninsulas, where no rivers run into the sea, conditions were favourable to the development of coral life, and in these parts the recent and Quaternary formations are thus represented by coral reefs. Elsewhere the corresponding formations are deltaic deposits of the rivers, mud, sands, and gravel. In the interior, the extensive plain between the rivers Sugut and Labuk and the foothills of the Kinebalu is probably covered by Quaternary deposits.

B. Tertiary formation.

Tertiary sandstones and shales and, to a much lesser extent, conglomerates and limestones, occupy a very important area of the east coast. We have not attempted to subdivide the Tertiary complex, except as regards the Cowie harbour region, examined by us in greater detail than the rest of the country.

The region of Sandakan and that drained by the river Kinebatangan, as well as an important part of Dent peninsula, are formed by Tertiary sediments. Sandstones of various colours and dark shales prevail. Gunong Gumantung, between Sandakan bay and the river Kinebatangan, with its famous caverns, covered with edible birds' nests and partly filled with guano, is made up of a massive limestone, full of corals and lithotamnium. Similar limestones are met with at several places along the Kinebatangan. A sample with foraminifera, taken from an outcrop a little above Kwala Koamut, contains *Operculina*, *Lepidocyclina*, and *Cycloclypeus*, which points to a lower Miocene or upper Oligocene age (Aquitanian-Burdigalian). On the rivers Tangkulap and Kramak, the

Danau formation must lie bare, the pebbles carried by these rivers belonging to this formation. Judging from similar evidence, Gunong Tingkak is most likely andesitic. The Tertiary depression of the Kinebatangan runs probably over to the west coast.

The Tertiary sediments of Dent peninsula have quite a different aspect. They represent a complex of marls, soft sandstones, conglomerates with andesitic pebbles, and volcanic tuffs of Miocene-Pliocene age. Jezler brought from the river Tunku a sandstone with *Operculina* and *Cycloclypeus*, pointing thus to Burdigalian or perhaps a little more recent age. At the bottom of this complex there are, on the Sigama, limestones identical with those mentioned from the Kinebatangan. Gunong Madai, between the rivers Klumpang and Tyinkayu, is a limestone hill (lower Miocene), with birds' nest caves, like Gunong Gumantung.

In the Cowie harbour region, the extreme south-east corner of British North Borneo, the Tertiary appears again. We have not surveyed the islands of Nunukan and Sibatik, and the rivers Masmas and Marutai only roughly. For this reason the Tertiary is marked here undivided on the maps. More detailed work having been done between the rivers Sarudong-Tambalunan and Kalabakang, we were able to distinguish here several lithologically well-defined divisions. Two mighty sandstone complexes, the Susui and the Kapilit sandstones, are separated from each other by the Tambalunan shales. The Kapilit sandstones rest again on a thick argillaceous horizon, the Kalabakang shales, representing the lowest division of the Tertiary complex. We distinguish thus two sandstone and two shale horizons. The boundary between the shales and the sandstones is not sharp. Alternating layers of both rocks form a gradual transition. We have separated two such mixed horizons, the Upper and the Lower Transition beds, though their limits are somewhat arbitrary, since argillaceous layers will also appear between the sandstone complexes, and sandstone beds are not altogether missing between the shales. The reason why we separated them was merely because the structural features of the region are thus more easily seen and understood. Owing to their greater resistance, the sandstones form the most prominent ranges, while the shales mark the depressions between them. The Kapilit sandstones are often conglomeratic, and in both sandstone complexes seams of lignite are intercalated. At Silimpopon the main seam of the Kapilit sandstones is mined. The shales are dark and crumbling, and contain as a rule calcareous concretions of varying size. The sandstones, intercalated between the shales, recall very much some sandstones of the Flysch formation of the Alps.

Terrigenous sediments, deposited near the shore in a shallow sea, vary rapidly not only vertically but also horizontally, so that a division based on the lithological character of such a sediment is of value only for a limited basin. For this reason we had some difficulty in correlating the strata of the upper Kalabakang valley, where Susui sandstones and

Tambalunan shales are marked on the maps. We have not to deal here any more with the same well-defined horizons as found farther south, in the Tambalunan valley. The sandstones are argillaceous and the shales of light colour and very well stratified. Coral limestones, altogether missing farther south, are frequently met with, especially on the rivers Kalobang and Yan. The synchronism of these strata with the Susui sandstones and the Tambalunan shales is however supported palæontologically. The Tambalunan shales and the underlying Transition beds in the Tambalunan valley contain not seldom *Foraminifera*, i.e. *Alveolina*, *Operculina*, and small *Nummulina*, indicating an upper Oligocene age. The overlying Susui sandstone would thus represent the lower (or the whole ?) Miocene. *Foraminifera*—small *Lepidocyclina* (*Nephrolepidina*)—from the upper Kalabakang and the Kalobang, a right tributary of the Kalabakang, point to lower Miocene. Though we have no palæontological evidence for the Eocene age of the Kalabakang shales, we do not think we are far from the truth in considering them as representing the base of the Tertiary.

C. Tertiary volcanic rocks.

Andesitic volcanoes, probably of Miocene age, occupy an important surface of Simporna peninsula and the adjacent islands. Small andesitic dykes are visible on the lower courses of the Apat, Balung, and Klumpang and on the south-west coast of Sibatik island. On Dent peninsula the Tunku range is built up of Tertiary andesites, and small dykes can be seen on the rivers Sigama and Sapagaya. We already mentioned that we have reasons to believe Gunong Tingkak, on the upper Kinebatangan, to be an andesitic dyke. In Sandakan bay, south-west of the town of Sandakan, a small exposure of volcanic lava seems to cover the folded Tertiary strata. Jezler found andesites on the rivers Labuk and Sugut, but since he did not separate them, on his sketches, from other eruptive rocks, such as ophiolites, we were not able to mark them on our map. A detailed petrographic description of these volcanic rocks will be given elsewhere.

D. Danau formation.

The interior of the Darvel Bay region, the central part of Dent peninsula, and the northern half of Simporna peninsula belong to a very complex formation, in all points identical with Molengraaff's Danau formation of Central Borneo (3). The leading rocks of this complex are cherts and radiolarites of various colours and a complete set of ophiolites. Conglomerates, sandstones and shales, and metamorphic schists, such as amphibolites, mica-schists and chloritoschists, accompany the former and form together a most intricate and, as a rule, brecciated complex. Exposures of eruptive rocks of more acid character, such as granites, granodiorites, and diorites, add to the complexity of this forma-

tion. The latter rocks might be younger than the Danau formation; the metamorphic schists are certainly older. Again, some of the sandstones and shales are probably lower Tertiary. All these rocks ought to be mapped separately, which we have tried to do on our original large-scale maps; but 1 : 20,000 proved to be still too small a scale for that purpose. It is thus quite impossible to try it on the map which we give here. The mode of formation and the stratigraphical position of this complex are still open questions, and our investigations are not sufficient to contribute to their solution. The radiolarites we brought from the river Blantian contain *Cenosphæra* Ehrenberg and *Dictyomitra* Zittel, but radiolaria are, unfortunately enough, not characteristic fossils from a stratigraphical point of view.

We have mentioned that the Danau formation must exist somewhere on the rivers Tangkulap and Kramak, northern tributaries of the Kinebatangan. Stamm found a small outcrop on the coast of Sandakan peninsula, at Batu Larai Larai. Jezler mentions radiolarites and ophiolites from the rivers Labuk and Sugut, and Pilz (6) and Hotz (verbal communication) found the Danau formation on Marudu peninsula and on Banguai island. It extends thus from the west coast of Dutch Borneo through Central Borneo to Berau and Tidung on the east coast, where Munniks de Yongh mentions it (8), and from here through British North Borneo up to its extreme north end. The conditions of formation of this complex of cherts and radiolarites, ophiolites, conglomerates, breccias, sandstones, and shales, in intimate association and genetic relation, is one of the most fascinating problems of palæo-oceanography.

Structural Features.

The Tertiary is folded. We can state, as a rule, that the older the Tertiary horizons are the more they have been affected by orogenetic disturbances. The folding process is thus disharmonic and the resulting folds are diapyre. This very peculiar kind of diastrophism takes place whenever strong sedimentation goes hand-in-hand with folding. It happened for various reasons during Tertiary times, and diapyre folds are thus the typical and worldwide structural element of disturbed Tertiary countries.

In the Cowie harbour region, the oldest Tertiary, the Kalabakang shales, have been squeezed and crumpled into most intricate folds and the intercalated sandstones have been broken and brecciated. The youngest Tertiary, however, the Susui sandstones, have merely been waved. The disharmony of the folds is moreover exaggerated by the difference of resistance offered by a sandstone or an argillaceous complex towards the folding forces. Shearing planes result and rigid sandstone beds will be pushed over wrinkled shales. This has been observed on a rather large scale on the upper Kalabakang river.

Owing to their upper Tertiary age, the deposits on Dent peninsula

have been less disturbed. Between the rivers Sigama and Silibukan, they form a broad syncline.

Along the Kinebatangan and in the Sandakan region, strike and dip vary in all directions. But here our survey is not detailed enough to reveal the real character and the general trend of the folds.

In the Cowie harbour region the direction of the folds is north-west–south-east. The Tertiary syncline, north of Darvel bay, has an east–west trend and the Kinebatangan valley corresponds with a Tertiary depression of the same direction, crossing over to the west coast.

The general trend of the Tertiary folds is thus north-west–south-east to west–east. During Tertiary times this part of the island of Borneo has undergone a compression more or less perpendicular to the meridian. The folding took place during the whole epoch, and the recent movements, observed at several places along the seaboard, seem to indicate that it is not yet altogether exhausted.

Much more interesting than the relatively simple folds of the Tertiary regions would be the knowledge of the structure of the Danau formation. Unfortunately, our investigations fail to advance the solution of this puzzling problem. Cherts and radiolarites, ophiolites (serpentine, gabbro, troctolite, diabase, variolite, spilite) shales and sandstones, conglomerates and breccias, are intricately intermingled. The terrigenous sediments have the aspect of alpine Flysch; elsewhere their aspect is identical with that of the red molasse, as it appears under the overthrusted "nappe de Morcle" in Val d'Illiez. The strata are not only strongly squeezed and bent, but stress has modified even the intimate structure of the rocks, which are dynamically metamorphosed. One will scarcely find sandstone banks of any extent; they have been broken up and lumps of irregular shape and dimension float in an argillaceous matrix, which has been pressed into the cracks of the brecciated sandstones.

The whole Danau formation gives the impression of a tremendous breccia. What the primary succession of the different rocks may have been and how much of its actual intricacy must be imputed to diastrophism, we do not venture to discuss. But we dare say that brecciated, laminated, and interfolded rocks like those met with in this formation, are never found in an autochthone country. A wide area of Borneo, corresponding with the extension of the Danau formation, represents for us the remnant of an extensively overfolded and overthrusted mountain belt. In the region of the Blantian valley we found the top of Gunong Tambuku, a very sharp peak, formed of amphibolic gneiss. The peak rests on a broad rounded ridge, where we discovered only cherts. It looks as if the metamorphic rocks were on all sides supported by the cherts. This would be direct evidence for the existence of overthrusts. The exposures are however not continuous enough to establish the fact beyond any doubt.

It is doubtful whether the problems connected with the Danau

formation will ever be solved, if we consider the drawbacks which handicap geological investigations in a tropical country like Borneo. Every square yard is covered with thick jungle, and outcrops are only found along running water. The geologist's task is reduced to mapping the rivers and noting the strike and dip and the nature of the exposed rocks. In making the map he will be able to interpret the geological features of a country, if its structure is not too complicated. It is possible to establish the stratigraphical sequences and the folds, whenever the strike and dip measured are a differential part of a structure. This is no longer the case in an overthrusted region, and here this surveying method, the only possible one, fails. The result is chaos and all attempts to interpret it are unfruitful. Our detailed original survey in regions where the Danau formation exists, illustrate this clearly.

Saltwater springs and mud volcanoes.

Fossil water, occluded in the Tertiary sediments, sometimes reaches the surface. The Tertiary being a marine formation, these waters are briny and often contain moreover sulphuretted hydrogen. Several brine pits exist in the Kinebatangan valley near the river. They mark clear open plots in the jungle, favourite meeting-grounds for all kinds of game. In the Cowie harbour region, on the Salimut, a right tributary of the Kalabakang, we came across some bubbling brine pits with strong exhalations of gaseous hydrocarbons. The natives call the place " Buol," which means " boiling " in Tidung.

The small islands of Boahan, Lihiman, Langaan, and Bakungan, due north of Sandakan, form a group of mud volcanoes. We have not been there personally, but Jezler visited them at our request. He states that the islands are formed of solidified mud and lumps of Tertiary sandstones of varying size, up to several cubic metres. Less frequent are fragments of ophiolites and cherts, andesites, and porous lava. A typical crater of some 10 metres diameter and 25 metres high exists on Lihiman island, and a mud stream runs from the crater towards the sea. The natives report that eruptions occur at irregular intervals, from one month to one year. They are said to be very violent, the ejection of mud and rocky fragments being accompanied by earthquakes. Jezler found no traces of gas, salt water, or oil. Some thirty-five years ago a new island was formed off the west coast (4). It was due to a mud volcano, having its seat in the oil- and gas-bearing Tertiary formation. We do not know whether we have to deal here with a similar case. The presence of rocks older than Tertiary would rather point to a deep-seated volcanic origin.

BIBLIOGRAPHY

(1) A. VAUGHAN YENNINGS. " Note on the Orbitoidal Limestone of North Borneo," *Geological Magazine*, 1888, pp. 529–532.
(2) TH. POSEWITZ. 'Borneo.' Berlin, 1889.
(3) G. A. MOLENGRAAFF. 'Borneo Expedition.' Leyden, 1902.

(4) C. SCHMIDT. "Ueber die Geologie von Nordwest-Borneo und eine daselbst entstandene neue Insel." 'Beiträge zur Geophysik,' pp. 121–136, Leipzig, 1904.

(5) J. A. STIGAND. "Some Contributions to the Physiography and Hydrography of North-East Borneo." *Geographical Journal*, January 1911, pp. 31–42.

(6) R. PILZ. "Geologische Studien in British-Nordborneo." 6. *Jahresbericht der Freiberger geologischen Gesellschaft*, Juli 1913.

(7) 'Verslag der Commissie tot uitzetting op het terrein van de tusschen het Nederlandsche gebied en Britisch Noord Borneo vastgestelde grens.' 's Gravenhage, 1913.

(8) W. D. MUNNIKS DE YONGH. "Aanteekeningen over de Tidong'sche Landen (Res. Z. en O. afd. van Borneo)." Bewerkt naar het rapport van W. D. Munniks de Yongh. 'Jaarbook van het Mynwezen in Nederl. Oost-Indie,' 42 Jaargang, 1913, Verhandelingen, pp. 22–35.

(9) H. YABE. 'Notes on a Carpenteria Limestone from B. N. Borneo.' Reprinted from the science reports of the Tohoku Imperial University, Second series (Geology), vol. v. No. 1, 1918.

(10) J. WANNER. "Beiträge zur Geologie und Geographie von Nordost-Borneo." Ergebnisse einer von Dr. K. Stamm in den Jahren 1913–1914 ausgeführten Reise, nach seinen hinterlassenen Aufzeichnungen und Sammlungen zusammengestellt und unter Mitwirkung von Prof. H. Bücking bearbeitet. 'Neues Jahrb. Min. Geol. Pal.,' 45 Beilage-Band, pp. 149–213. Stuttgart, 1921.

THE TIDES AND THE WORK OF THE TIDAL INSTITUTE, LIVERPOOL

Dr. A. T. Doodson, Secretary of the Institute

Read at the Afternoon Meeting of the Society, 10 *October* 1923.

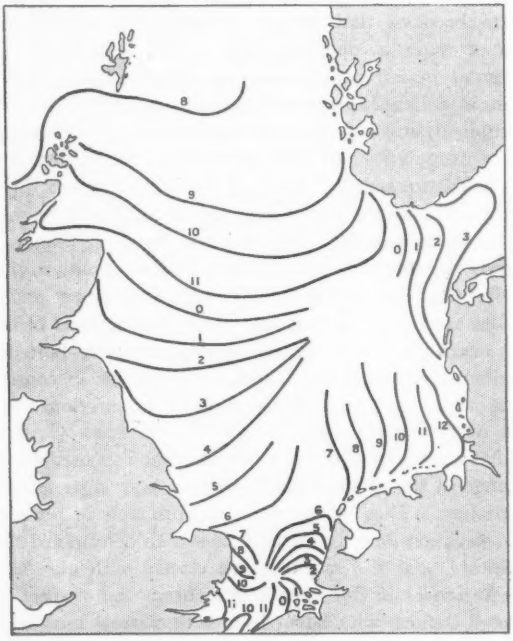
PREVIOUS to the establishment of the Liverpool Tidal Institute in March 1919, research on tides in this country had been left to the efforts of individual scientific men such as Kelvin and George Darwin, and with the exception of Laplace this country had produced all the great pioneers in the subject. But the increasing detail of the work necessary for advance had long made urgent a permanent Research Institute. The primary object of the Institute founded in Liverpool in 1919 with funds generously provided by Sir A. A. Booth and Mr. C. Booth in the first place, and with Prof. Proudman as Hon. Director, is "to prosecute continuously scientific research into all aspects of knowledge of the tides." The Institute so founded was given accommodation in the Holt Physics Building of the University of Liverpool, and has been governed by a Committee nominated by the Council of the University. In July 1923 an arrangement came into force whereby the Institute and Bidston Observatory are governed by a Joint Committee of the University and Mersey Dock and Harbour Board. At the present time the staff of the

Institute consists of the Hon. Director, the Secretary, and two assistants. The research so far carried out has been largely concerned with the analysis and prediction of tides, but the wider interests of the subject have also been considered, with some degree of success. It is proposed to consider firstly those parts of modern research work which have a geographical interest.

The ultimate state of knowledge of the tides will exist when the tides can be explained quantitatively without reference to observation. Since the tide-generating forces due to the sun and moon are known, then the problem becomes that of the mathematical treatment of forced oscillations of water in definite basins. The geographical element is of fundamental importance because the tides are profoundly affected by the basin in which they are maintained. But this ideal state has not yet been attained, and only in a few cases has it been found possible to bring all the irregularities of a natural body of water, just as they exist, into a dynamical treatment. The first instance in which this was done was in connection with the longitudinal seiches of Lake Geneva. Seiches are not tidal motions in the ordinary sense, for Lake Geneva is far too small a body for the tide-generating forces to produce much effect. They are free oscillations excited by local disturbances such as wind, whereas tides are forced oscillations. The great interest of the problem is that the exact periods of the free oscillations have been found by a precise mathematical method. There are problems in connection with actual tides which have to be discussed in connection with the free oscillations of the basin; this is especially the case where the forced oscillation has a period nearly equal to that of the free oscillation, in which case the range of the oscillation will become very large, apart from the effects of friction. This, of course, is the principle of resonance. The periods and elevation-form for Geneva have been determined by members of the Institute, and the results agree closely with observation. The only other instances of complete treatment in this respect are due to Sterneck and Defant, who have dealt with narrow seas and channels such as the Adriatic Sea and the Red Sea. These examples deal with forced oscillations, the motions at the mouths of the seas being taken from observation. Such methods, however, have only been applied to seas and channels so narrow that transverse motions have been negligible, and the incorporation of all geographical details for a broad sea such as the North Sea has not yet been achieved.

In general, therefore, the detailed explanation of tides is very incomplete, and attention has been largely given in the past to the geographical distribution of tides, usually described by means of cotidal lines, and utilizing actual observations on the coasts. A cotidal line connects points at which high water occurs at the same instant of time. The drawing of cotidal lines across seas and oceans from coastal data alone is a matter of considerable uncertainty, as may be seen from Figs. 1–3 for the North Sea.

The systems of cotidal lines there illustrated are fundamentally different, though the coastal information is practically the same in each instance. In Whewell's Map (Fig. 1) the lines are drawn on the theory of a progressive wave moving quickly or slowly according to the depth. Similar maps have been drawn for the oceans, the tendency often being to make the lines much more convex than Whewell's. The explanation of the tides in the North Atlantic Ocean as being due only to a progressive wave travelling from the South Pacific Ocean towards the North Pole,

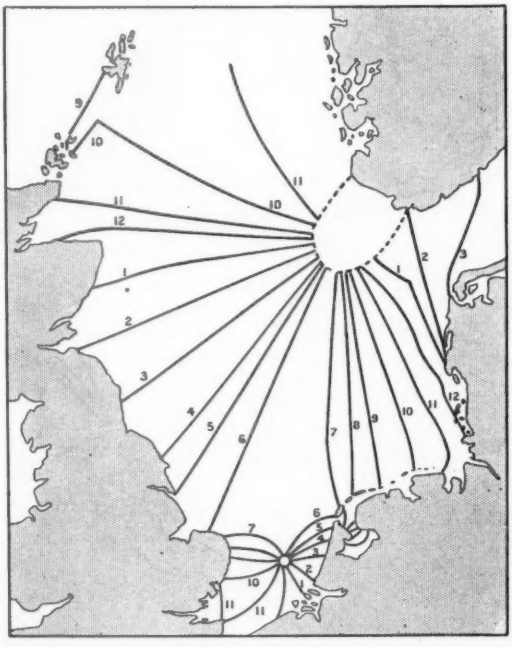


1. Co-tidal lines for the North Sea according to W. Whewell, 1836.

however, has been severely criticized. The maps set forth by Harris and Sterneck (Figs. 2, 3) are based upon theories of standing oscillations, the influence of the Earth's rotation being allowed for. Here again the difference between the two theories is very marked. Without considering details at all it may be stated that Harris's theory cannot be supported on *à priori* grounds, nor does his map accord with actual facts, as we shall see later. Sterneck appears to have utilized the principle that cotidal lines for phases differing by 180° should be as nearly parallel as is consistent with observation, and there is a good deal of theoretical justification for this principle.

Apart from the effects of friction and rotation the principal part of

the tidal oscillations in the North Sea would be practically a standing oscillation with two nodal lines about the latitudes 55° N. and 58° N. Along these lines there would be zero range of tide, but across the lines strong tidal currents would exist three hours before or after the time of high water in the adjoining regions. The effect of the Earth's rotation on these currents would be a surface gradient along the line, and so there would be a tidal oscillation of level on the line, the range now being zero at only one point on it. The phase of this superposed oscillation will thus change by 180° as we pass along the nodal line and through the point,



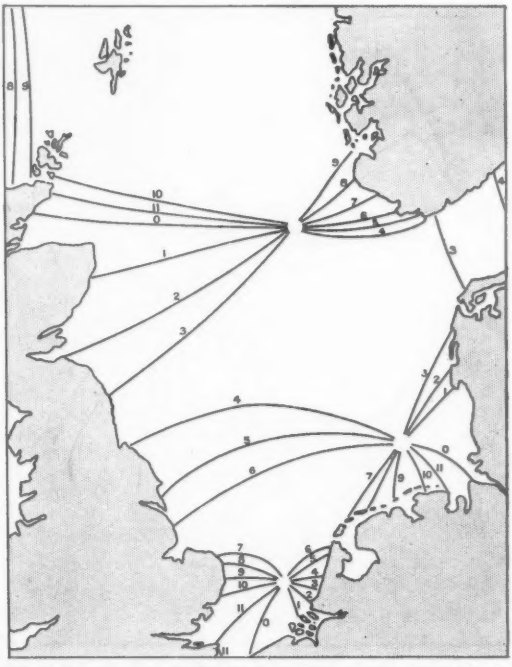
2. Co-tidal lines for the North Sea according to R. A. Harris, 1904.

and similarly the phase of the original standing oscillation changes by 180° as we pass through this point transversely to the nodal line. It can readily be shown that the combined oscillation will change phase by 180° as we pass through this point in any direction, and that within the neighbourhood of the point all possible phases exist, so that a complete set of cotidal lines radiate from the point. This unique point of zero range, the residual point for the nodal line of zero range without rotation, is called an "amphidromic point," and the above explanation agrees fairly well with the points indicated by Sterneck.

A purely mathematical investigation of the tides in a rotating rect-

angular gulf of constant depth and with approximately the same dimensions as the North Sea has been given by Mr. G. I. Taylor, and his results show two amphidromic points symmetrically placed in the gulf, corresponding roughly with those of Sterneck.

Sterneck's map is thus an advance on previous maps and gives a rough idea of the actual conditions. If we include the effect of friction, however, it is readily apparent that the range of tide decreases northwards along the continental coast of the North Sea, and thus there is a bias of the amphidromic point towards this coast, this bias increasing

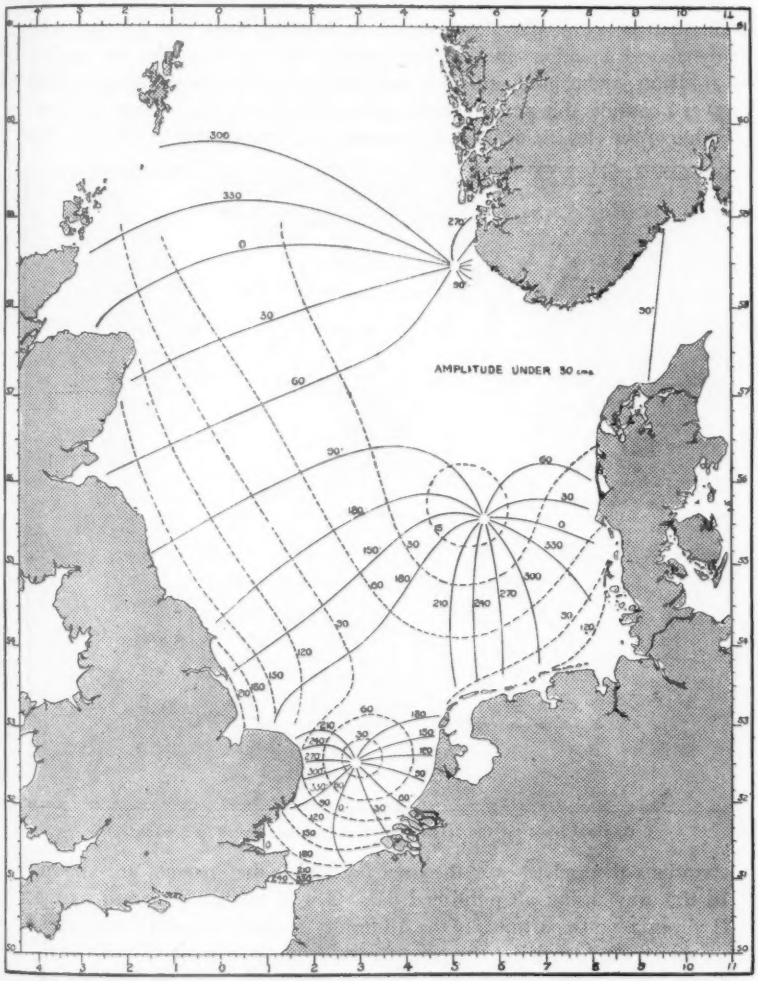


3. Co-tidal lines for the North Sea according to R. Sterneck, 1920.

northwards. The northerly amphidromic point should be much nearer than the southerly point to the coast.

Theoretically the position of an amphidromic point depends on the " speed " of the tidal motion, and each harmonic constituent of the tides has its own amphidromic point, though all the semidiurnal constituents will have their amphidromic points near to one another. Thus actually the range of tide will not always vanish, though it will be small near the amphidromic point of the principal lunar semidiurnal constituent, M_2. At and near such points diurnal tides and quarter diurnal tides may become relatively prominent.

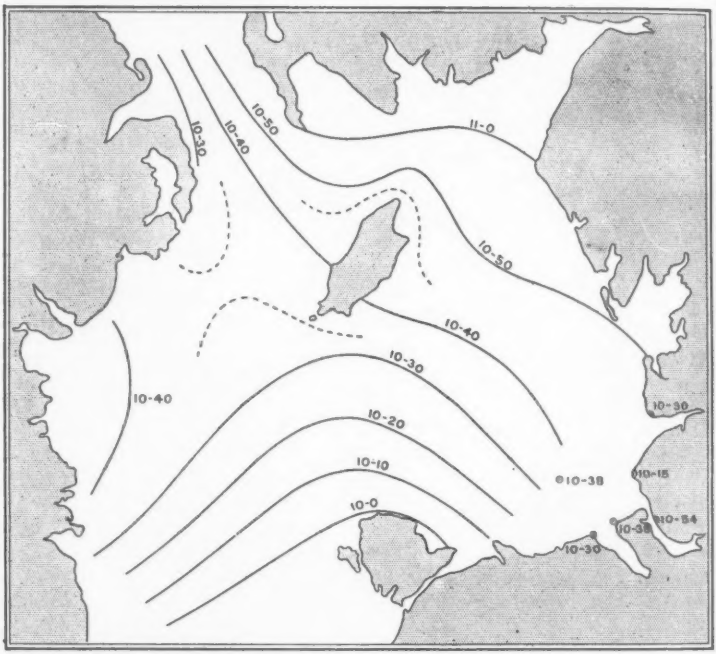
So far we have dealt with maps of cotidal lines drawn from coastal data only, and we now proceed to discuss one of the most successful efforts of the Tidal Institute.



4. Co-tidal and Co-range lines for the North Sea according to the Tidal Institute, 1923.
———— Co-tidal - - - - - - Co-range lines.

It would appear at first sight that a map of cotidal lines would be most easily drawn from direct observations of the rise and fall of the tide at a number of places. But direct observation is very difficult, and even when practicable is very expensive, so that extremely little

reliable information has been obtained in this way. But the observation of tidal currents is not so difficult, and a relatively large amount of information is available for the currents in the North Sea, systematic observation and harmonic analysis having been made by the "Conseil Permanent pour l'Exploration de la Mer." Now the Fundamental dynamical equations of the tides connect the currents with the surface gradients, and consequently it is possible to calculate the surface gradients over a considerable portion of the area of the North Sea. From a knowledge of the elevations along the coasts it is then possible to calculate the

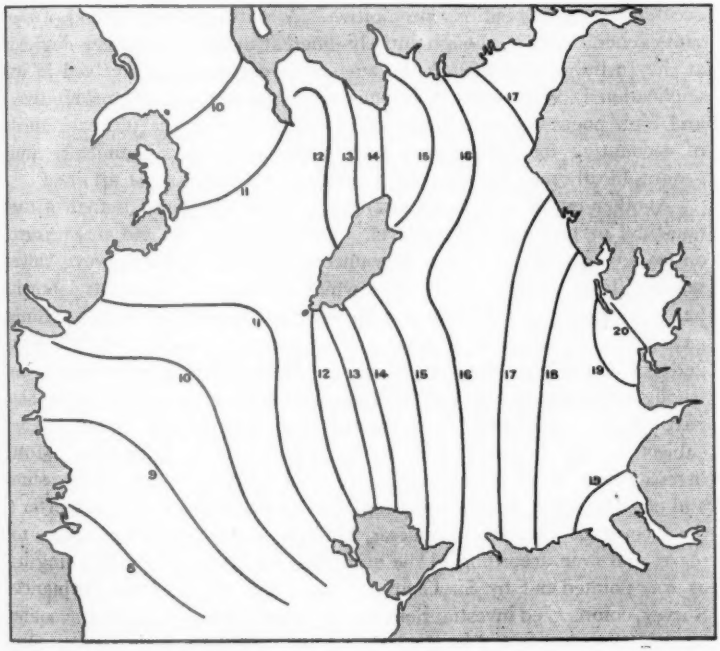


5. Co-tidal lines for the Irish Sea (time in lunar hours and minutes).

elevations themselves over the area for which the currents are known. In this way, using all published data as well as that possessed by the Hydrographic Department of the Admiralty, a chart has been constructed, shown in Fig. 4, giving the characteristics of the principal lunar semi-diurnal constituent of the tides in the North Sea. The semi-ranges, or amplitudes, are given in centimetres, and the angles shown on the cotidal lines give the phase-lags according to the harmonic method. The time of high water at a given place, in mean solar hours after the time of transit of the moon at Greenwich, is equal, on the average, to the phase-lag divided by 29. The latest and most complete form of this chart

nas been undertaken for the Admiralty. Similar methods have been applied to the tides of the northern portion of the Irish Sea, though the current data are much less complete than those available for the North Sea. The resulting charts, shown in Figs. 5, 6, have been published in the handbook called 'Merseyside' which the British Association prepared in connection with the meeting at Liverpool. This is believed to be the first time that such charts have been produced as here described.

The Tidal Institute map does not profess to give an explanation, nor is it based upon speculative theory, but it provides a fairly exact



6. Co-range lines for the Irish Sea (range in feet).

description of the tides in the North Sea, and thus has geographical interest. The maps of cotidal lines for the North Sea given at present in atlases are entirely inaccurate; they are based upon a progressive wave theory which is untenable. Apart from and without deprecating the descriptive value of the results, the use of current data plus coastal data is a step away from the mathematical-geographical explanation of tides regarded as the ultimate ideal. But great hopes are entertained at the Institute regarding an idea due to Prof. Proudman; he has outlined a method, based upon exact dynamical equations, which theoretically determines the tidal motion in a sea from a knowledge only of the

coastal observations, geographical details of the basin, and of the tide-generating force. It may be applied to oceans where current and elevation observations are impossible, and though the labour involved is of course fairly large it is not at all excessive. It may thus be possible before long to give accurate cotidal lines for the oceans without recourse to speculative theories.

The mathematician Henri Poincaré reduced the complete dynamical explanation of the tides, the ideal mentioned at the beginning, to a sequence of direct mathematical operations, but he fully admitted that the amount of computation required to apply his process to the actual oceanic basins was entirely prohibitive. A mathematical method of the same general nature, though entirely different in detail, has been devised at the Institute, and though the amount of computation involved in its application is very large, it is believed to be not entirely prohibitive, and high hopes are entertained of its future. Thus the ultimate ideal of accounting for the tides in such bodies of water dynamically and geographically may be regarded as in sight, though not yet attained.

Another matter that has a strong geographical interest is that of the non-tidal perturbations of sea-level. The effects of wind and air pressure on sea-level are of importance in connection with Geodetic Surveys, since sea-level is an obvious datum from which to take measurements; but it has been shown by the Ordnance Survey that measurements by levelling gave mean sea-levels at Dunbar and at Liverpool respectively 0·8 foot and 0·4 foot higher than at Newlyn. These discrepancies cannot be wholly attributed to errors of levelling, and there is reason to think that part of the explanation is connected with atmospheric causes. The subject is very important also to navigators and to engineers. Most investigations of the phenomena have been concerned with air-pressure and not with wind, the sea being regarded as a negative water barometer; the "constant" for the barometer, however, varies much from place to place, and even according to the numerical method used in obtaining it, as was pointed out by Sir Charles Close. Mr. Jolly, of the Ordnance Survey, commenced investigations with a formula which takes into account barometric pressure and its gradients in two directions, and this formula, because it lends itself very easily to numerical methods, has been extensively used at the Institute. Many interesting results have been obtained in connection with the most effective winds for raising sea-level at a given place, and the directions of those winds have been found for several places on the British coasts.

Many previous investigators, dealing with the perturbations of mean sea-level on the Continental coast of the North Sea, have found that the most effective winds for raising sea-level there are those which blow towards the shore, and conclusions have been formulated that the effect is due to the local wind blowing the water towards the coast. This conclusion is not substantiated by the results obtained at the Institute, for

the winds which raise sea-level on the east coast of Britain blow away from the land; the same winds raise sea-level on the continental coast, so that westerly winds raise the level of the whole of that sea in some degree or other. The predominating factor in the results obtained for the Irish Sea is the southerly wind operating on the Atlantic water south of Ireland. This conclusion has been verified for Liverpool by applying an extension of the formula so as to include Atlantic pressure gradients (or winds) taken south of Ireland, as well as local gradients (or winds). The results show that for a given wind-strength operating in the most favourable direction in each case, the Atlantic wind has 50 per cent. more effect at Liverpool than the local wind, in spite of the deeper Atlantic water being less favourable to wind effects. Further, the most effective Atlantic wind blows from the south, and the most effective local wind from almost due west.

Some interesting time relations have also been discovered; for example, when we correlate the pressure system at a fixed time with the sea-level at a variable time, we find that the correlation between sea-level at Liverpool and an easterly gradient of pressure, corresponding roughly to a south wind, is greatest when the sea-level is taken about fifteen hours later than the corresponding pressure gradient. For a northerly gradient, however, the time difference for maximum correlation with mean level at Liverpool is practically zero. These results are in conformity with those just discussed, for we should expect a large time interval for setting up the circulation of water from the Atlantic, and a small time interval for effects generated in the Irish Sea. A very interesting time relation between pressure and sea-level has also been discovered: instead of a lag we now have a time advance of about three hours, the changes in sea-level anticipating the changes in barometer.

Explanations of these facts have been sought on dynamical principles. A paper will be published from the Institute which deals with the time relations and which shows that for a wind or pressure disturbance suddenly created and then maintained constant the sea-level rises above its ultimate equilibrium state and then oscillates about it with a diminishing amplitude. This result has a good deal of interest in connection with storm effects, for the large perturbations of sea-level due to sudden storms do not seem to be adequately allowed for by the formula that has been used. The whole problem is essentially a dynamical one, and further progress must be sought on dynamical principles. A recent paper by Dr. H. Jeffreys on winds blowing near to a long straight coast is a definite advance on the subject, and shows how the geographical conditions affect the phenomena.

Some attention has been given at the Institute to the effects of bays, promontories, and islands upon the tidal oscillations, but it is impracticable to describe the results here. The effect of an estuary is well known, the time of rising being shortened relatively to the time of falling. This

effect is very important in the prediction of tides, and up to the present it has been inadequately allowed for. Consequently a very great deal of time has been devoted to the effects of shallow water upon tides, and the reasons why the phenomena have been incorrectly rendered in predictions are now quite clear. The apparent failure of the harmonic method of prediction in many places is largely due to this cause. It has now been shown that the harmonic method may be entirely unsuited to express the shallow water perturbations of the tide, but it has also been shown that the effect can be represented as a rule by simple corrections dependent only on the range of tide. These corrections will appear for the first time in the tide tables computed by the Institute for Liverpool for the year 1924.

The effects of friction on the tides are also under consideration at the Institute. Allowance was made for friction when drawing the cotidal map of the North Sea, but the result of greatest interest is in connection with the tides in the Bay of Fundy. These did not seem to be susceptible to a certain law, in that the harmonic "constants" were not constant from year to year. The perturbations of the "constants" has been shown to be due to friction introducing a variation in the tides which is not indicated by the tide-generating potential. This effect can be traced in other places also.

Another object of the Institute is to carry out research work for other bodies, and at the present time three pieces of work of geographical interest are being done for (1) the Gold Coast Survey; (2) the Australasian Antarctic Expedition, 1911–1914; and (3) the work of Messrs. Lester and Bagshawe in Graham Land (*G. J.*, September 1923). In each case tidal observations are being analyzed.

References:

Sir C. CLOSE: *Geog. Jour.*, July 1918.

Mr. G. I. TAYLOR: *Proc. Lon. Math. Soc.* (2), v. **20**, 1920.

Dr. H. JEFFREYS: *Phil. Mag.*, vol. **46**, July 1923.

M. H. POINCARÉ: "Théorie des Marées," *Leçons de Mécanique Céleste.* t. **3**, 1910.

Before the paper the PRESIDENT (the EARL OF RONALDSHAY) said: This afternoon we are to have an account of the work of the Tidal Institute at Liverpool. Until quite recently work of that kind has, I understand, only been carried on by individuals. But in 1919, thanks to the generosity of Sir Alfred Booth and his brother, an Institute was inaugurated at Liverpool at which investigation into the action of tides might be undertaken systematically and from every point of view. It is an account of the work which has been done there and the results of that work during the past four years that we are to be given this afternoon by Dr. Doodson, who has been Secretary of the Institute practically since it started. The subject, though necessarily a very technical one, should therefore be one of very considerable interest, especially to the scientific world, and we shall look forward with much pleasure, therefore, to hearing from Dr. Doodson an account of the work.

Dr. Doodson then read the paper printed above, and a discussion followed.

The PRESIDENT: I understand that Prof. Proudman, the Honorary Director of the Institute, is here this afternoon, and we should all be delighted if he would say a few words on the subject.

Prof. PROUDMAN: I do not think I can add anything to the admirable account Dr. Doodson has given us of some of the work at Liverpool. You will have noticed that he has restricted himself to those parts which he can explain by means of maps, whereas, as he said in the early part of his remarks, most of his time has been spent on other things, such as analysing observations. During the course of his lecture he referred to my name several times, but I should like to emphasize that the real success of the Institute is due entirely to Dr. Doodson. It is an easy matter to throw out mathematical speculations, but quite another matter to bring them down until you can draw diagrams and maps in the way he has shown us. Dr. Doodson's aptitude for turning mathematical formulæ into numerical results and for taking observations and getting the very best out of them and in knowing how to interpolate where things are a little obscure, is simply wonderful. I doubt if in his own particular line he has a rival anywhere.

The PRESIDENT: The Hydrographer to the Admiralty regrets his inability to be present this afternoon, but he has a representative here in Commander Warburg of the Hydrographic Department of the Admiralty. I ask him if he would like to add anything.

Commander WARBURG (Hydrographic Department of the Admiralty): I can say only that the Hydrographic Department, and my branch in particular, which is the tidal branch, are benefiting very much indeed from the work of the Tidal Institute. But I personally represent the practice more than the theory, and so I do not think I can add anything to the discussion.

Colonel E. M. JACK (Director-General, Ordnance Survey): I am afraid I also cannot say very much. We are dealing with an extremely abstruse subject, which is much better left to the mathematicians. It is evident that the Tidal Institute is doing work of first scientific importance, and it strikes me as very remarkable and interesting that this Institute—I am afraid I do not know the facts—appears to have been started entirely by private effort, and is possibly being carried on in the same way. I do not know what Government support it has.

Prof. PROUDMAN: It has had some.

Colonel JACK: I think Liverpool is to be congratulated on having started an Institute of this sort entirely by private enterprise. As to the point with regard to the difference of sea-level between Dunbar and Newlyn being 0·8 of a foot, perhaps Mr. Jolly will be able to tell us something about that. Our estimate was, that of that 0·8 of a foot about 0·1 was due to atmospheric effects and about 0·2 or 0·3 due to imperfections of levelling; but the other half we were unable to account for at all, and we hope that the Tidal Institute will be able to explain it at some time. I was very much struck by the fact that in two or three cases information had been given by the Institute on a particular aspect of this subject for the first time, which shows the very remarkable value of the work being done, and also that we are on the eve of some very interesting discoveries. I should like to express my appreciation of the very valuable and interesting paper.

Mr. H. L. P. JOLLY (Ordnance Survey): I should like to begin my few remarks on a note which we have already heard this evening: that Dr. Doodson does not do himself justice. He was good enough to mention my name in

connection with a method of allowing for the effect of barometric height and wind on the level of the sea. I ought to mention that whilst I was doing this work Dr. Doodson himself was, I believe, using a method almost, if not exactly, the same, and it was merely a matter of luck that mine happened to get into print first. From that moment onwards Dr. Doodson has written and spoken as if the method were mine. I might say also that I only derived it from reading accounts by workers in other lands. It is very much allied to methods hitherto used by Scandinavian workers.

With regard to the difference of sea-level at the two ends of England which was determined by recent geodetic levelling, as the Director-General of the Ordnance Survey has just mentioned, there is a difference of 0·8 foot between the two. Of that about 1½ inches is possibly due to errors in levelling, but it is very improbable that more than about 2 inches is due to such errors. And 1 inch can undoubtedly be put down to the height of the barometer. The remainder I should be inclined to think is due to the wind effects that we have heard about this evening.

The whole subject of this evening's discussion is one of extraordinary difficulty, and nearly everybody, I think, imagined that we have reached a sort of limit. One had always imagined that harmonic analysis was the last word in the matter of tides; but no, every time we hear from our friends at Liverpool or read something of theirs, there is always some wonderfully interesting new development; and that has occurred to-night.

There was one word Dr. Doodson let fall which I think was very suggestive: the word "reflexion." It has always seemed to me that the problem of the tide has very much in common with other branches of the wave theory. Consider, for instance, the great differences in the heights of the tides within one body of water, such as the English Channel. At Weymouth one has a range of tide of about 6 feet. On the other side of the Channel it is hundreds per cent. more than that. That can, I presume, only be due to some interaction between the boundaries and the body of water considered, and without considering the question from that point of view one will not get very much further ahead. I am not in a position to make any suggestions as to the lines on which developments in the work of the Tidal Institute will go on, but I can only express the hope that they will go on with the same interesting results which we have been used to in the past.

Dr. J. W. EVANS: I should like to ask one question. We were told that observations were made in submarines lying at the bottom of the North Sea as to the variation in pressure. Was that variation in pressure due to currents or to the varying height of the tides? I did not quite gather which it was. There would be variations in the hydrostatic pressure due to the height of the tides, and there would be variation in the current pressure due to the varying currents. Which was it that was observed in the submarine?

Dr. DOODSON: I take it that when the submarine was at the bottom it was a case of varying pressure due to the height of the tide—the barometer of course had to be taken into account—which was registered on the pressure-recording instruments of the submarine.

Dr. EVANS: May I ask whether it would be possible to have some sort of pressure-gauge so constructed that changes in pressure varied the resistance in a circuit, so that by sinking the gauge at any part of the sea one could register the variations in the height of the tide?

Mr. HINKS: I should like to ask Commander Warburg a question suggested by Dr. Evans' inquiry. I believe there is a tide gauge produced by a man

called Favé, the *marégraphe plongeur*, which we heard about some time ago. Can Commander Warburg say whether it is a success?

Commander WARBURG: Yes, I think the *marégraphe plongeur* is a success. It has disadvantages, as all instruments have, and its principal disadvantage is that it must be buoyed. In frequented waters such as the North Sea the buoy rope is likely to be cut by passing vessels and the instrument lost. As a consequence, it is no longer in use in the North Sea, or rather as we have this very excellent chart produced by the Tidal Institute, which is computed from stream observations, not from tidal observations, its use there is not so great. But we have two in use now in the *Fantome*, in Australia, a vessel which is taking observations in the Torres Strait, which should be very useful in course of time. I might say with regard to the submarine observations, the records which Dr. Doodson referred to were obtained on the submarine's depth recorder, so of course they did record only the vertical height. They were not affected by horizontal pressure of the stream at all. It was purely the vertical height that was recorded.

The PRESIDENT: I think that the discussion this afternoon has shown how little familiar the public is with the subject of our lecture. It is indeed, I think, quite possible that there may be some present this afternoon who before the announcement of this lecture did not even know that there was such a thing as a Tidal Institute in existence. The lecturer has certainly made it clear, nevertheless, that, quite apart from its scientific interest, the work which has been carried on in the Tidal Institute at Liverpool during the past five years has been work of great practical value, and we may congratulate ourselves, I think, that through the agency of our *Journal* we shall make this very important work known to a large circle of the educated public. I would express, on your behalf, our great indebtedness to Dr. Doodson for the admirably lucid manner in which he has placed before us what is clearly a very technical subject.

THE GEODETIC EVIDENCE FOR THE SUPPOSED WESTERLY DRIFT OF GREENLAND

Colonel Sir Charles Close, K.B.E., C.M.G., F.R.S.

AS is well known, Dr. Wegener partly based his theory of the movement of the continents upon the evidence available with regard to the increase in the value of longitude (west of Greenwich), of certain stations on the north-east coast of Greenland. In his work 'Die Entstehung der Kontinente und Ozeane,' he had available for discussion the longitude determinations of Sabine (1823), Börgen-Copeland (1870), and Koch (1907); the results of the latter were published in vol. 6 of 'Danmark-Ekspeditionen til Grönlands Nordöstkyst, 1906–8.' Dr. Wegener has also published a review of Koch's discussion in *Astronomischen Nachrichten*, vol. 208.

The determinations of Börgen (1870) and Koch (1907) differ by almost exactly 10 seconds of time, the later value being the more westerly. In *Petermanns Mitteilungen* for October–November 1921 will be found a critical examination of the matter by Dr. F. Burmeister.

The stations of Börgen and Koch have been identified and have been connected geodetically, so that they can be directly compared. It may be accepted that the geodetic measurement is sufficiently accurate. An investigation of Koch's results shows that the "probable" error derived from the inter-accordance of the values of longitude is 1·63 seconds of time. There were twelve observations, taken on eleven days in September, October, and November 1907.

The method adopted was that of moon culminations. In this method the observation is made with a transit instrument, or transit theodolite, set in the plane of the meridian; and the time of transit of the moon's bright limb is compared with the time of transit of a neighbouring star, and from this comparison the moon's right ascension is deduced, and from this the longitude. An error of a second of time in the deduced right ascension will produce an error in longitude of about 30 seconds of time. Dr. Burmeister appropriately quotes Chauvenet, who in his 'Spherical and Practical Astronomy' gives a very complete discussion of the question of the accuracy of the results of moon culminations. Chauvenet says that the probable limit of accuracy, in longitude, is one second of time, and that this degree of precision can only be attained after two or three years of work, comprising a great many observations. It is therefore quite unsafe to assume that the real error of the mean of Koch's twelve observations of 1907 is likely to be as low as 1·6 seconds.

Errors must be looked for in the clock, in personal equation, and even in the uncertainty which attaches to the corrections to the ephemeris. In the observations in question no chronograph was available, and the moment of transit was determined by the usual rough field methods. There were no means of determining personal equation; and, with regard to the corrected Greenwich positions of the moon, it would not be surprising if the error in longitude, due to this cause alone, were to exceed 3 seconds of time.

Similar remarks apply to Börgen's observations of 1870. He observed fourteen culminations. As to Sabine's observations of 1823, Dr. Burmeister remarks that the position occupied is not known with certainty. Sabine's observations consisted of 12 moon culminations and 110 lunar distances, observed with a sextant.

Since Dr. Burmeister wrote his article a new and important expedition has carried out valuable work in Greenland, this time on the south-west coast. The operations were under the direction of Lieut.-Colonel P. F. Jensen, who writes an account entitled "Ekspeditionen til Vestgrönland, Sommeren 1922." This account is written in Danish, but it contains a summary in French. One of the objects of the expedition was to fix, on behalf of the Geodetic Service of Denmark, the longitude of some point near Godthaab, on the south-west coast, in order that the Wegener hypothesis might be tested. Godthaab was selected because in 1863 the Danish naval officers, Lieutenants Falbe and Bluhme, determined the

longitude of a known point there by means of moon culminations; and in 1882–83 another Danish officer, Lieutenant Ryder, again determined the longitude of the same place by the same means.

An account of these observations of 1863 and 1882–83 is given in a report on 'Observations internationales polaires 1882–3. Expédition danoise. Observations faites à Godthaab, sous la direction de Adam Poulsen. . . . La longitude de Godthaab.'

It is stated that only those observations of Lieuts. Falbe and Bluhme were chosen which could be compared with stars culminating in the immediate neighbourhood of the moon. Four of Falbe's and two of Bluhme's were taken. In seconds of time the results were: 55·3, 57·4, 53·3, 59·8 for Falbe; and for Bluhme, 54·2, 52·6. In addition to these there are two values of Lieut. Falbe which were observed at Kajartalik and connected with Godthaab by chronometer, giving as results 53·1 and 55·0. The mean of all these eight is $55^{s}\cdot2$ ($0^{s}\cdot1$ being added for reduction to the "pyramid" of reference). Perhaps the safest value for 1863 would be the mean of the first six, viz. $55^{s}\cdot4$.

Lieut. Ryder's observations of 1882–3, at Godthaab, were taken from September to April; they are moon culminations, as before. Rejecting unsatisfactory observations, ten were finally selected, and the resulting longitudes, in seconds of time, were: 48·2, 51·0, 55·4, 57·2, 55·6, 55·4, 52·2, 48·8, 55·7, 48·6; the mean for 1882–3 being $52^{s}\cdot8$.

If, then, we were to treat these determinations on the south-west coast in 1863 and in 1882–3, as Koch treated those on the north-east coast taken in 1870 and 1907, we should say that south-west Greenland had moved $2^{s}\cdot6$ in an *easterly* direction during the elapsed period. But, as indicated above, the uncertainty which attaches to values of longitude derived from moon culminations precludes such an inference.

We now come to the results of Lieut.-Colonel Jensen's expedition, which took place during the summer of 1922. Greenwich time was derived from wireless signals from Nauen. For the determination of local time the method of star transits was employed, the instrument used being a theodolite of 13·5 cm. diameter, with an objective of 3·5 cm. There were two box chronometers, one mean time, one sidereal. Polaris was used for setting the theodolite in the meridian, and the necessary corrections were applied for azimuth error. For the purpose of testing the Wegener hypothesis, the same station at Godthaab was observed at as was used in the observations of 1863 and 1882–3. Lieut.-Colonel Jensen's determinations of longitude appear to be of a very satisfactory accuracy. He gives as his final values:

$3^{h}\ 26^{m}\ 58^{s}\cdot7 \pm 0^{s}\cdot1$ . . . 1922

this is to be compared with

$3^{h}\ 26^{m}\ 52^{s}\cdot8$ 1882–3

and $3^{h}\ 26^{m}\ 55^{s}\cdot4$ 1863

If we were to take the mean of the last two, we should get (seconds only), $54^{s}{\cdot}1$; but we may, with Lieut.-Colonel Jensen, take the mean of all the separate culmination values obtained in 1863 and in 1882–3, in which case the mean is $53^{s}{\cdot}8$. This differs from the wireless value by $4^{s}{\cdot}9$.

There were eighteen separate values obtained in 1863 and in 1882–3, and, if we assume that the wireless determination of 1922 is relatively errorless, the only lesson that could safely be derived from the comparison would be, that the mean of eighteen values of longitude derived from moon culminations was about 5 seconds in error—a very likely result. This seems to be the proper conclusion, and not that Greenland is moving westward at the rate of 20 metres a year.

We cannot, therefore, agree with Lieut.-Colonel Jensen when he sums up the matter in the following words: "Le résultat de la recherche susmentionnée doit donc être que, même si tout le déplacement en longitude trouvé—$4^{s}{\cdot}9$—n'est pas réel, il fournit avec une grande sûreté une expression du déplacement du Groënland vers l'ouest pendant la période en question, et un example qui confirme l'hypothèse de Wegener au sujet de ce déplacement."

The hypothesis must, on the contrary, remain "unproven" until, after a suitable interval of time, another wireless determination of the longitude of Godthaab is made. Whilst, then, the hypothesis remains where it was, there is, on the other hand, no geodetic evidence against it, and we must thank Lieut.-Colonel Jensen and the Danish authorities for providing the means for the future settlement of this very interesting question.

THE DAMASCUS-BAGHDAD MOTOR ROUTE

E. H. Keeling

WITH the establishment of a weekly motor service from Beirut to Baghdad the long-cherished hope of a regular overland route to 'Iraq has become a reality. Baghdad is now within forty-eight hours of Beirut and nine days of England. One may leave London for Marseilles any Thursday afternoon, take the ordinary P. & O. mail steamer to Port Said, and have every prospect of being in Baghdad on Saturday afternoon of the following week, though after rain in the desert the journey may be delayed for a day or two. Actually one is moving for less than seven days, because the best part of a day is spent at Marseilles, nearly half a day at Port Said, five hours at Qantara, a night at Damascus, and a night bivouacking in the desert. The ordinary route overland to Marseilles and thence *viâ* Bombay and Basra takes twenty-three days.

From Port Said to Haifa is a night's journey by train, broken at Qantara, where we cross the Suez Canal by ferry. At Haifa we are met

by Buick cars which run a daily mail service from Palestine to Beirut, the capital of French Syria. Our route lies for 100 miles up the coast through Acre, Tyre, and Sidon, with enchanting views of the Mediterranean but a wretched road. Between Haifa and Acre the track runs now along the sandy beach, with the sea lapping the wheels of the car, now among the dunes. The traffic is heavy and varied—camels, donkeys, and innumerable Ford cars—and the driver has taken the precaution of putting a whistle between his teeth, for he wants both hands on the steering wheel if the car is to be kept right side up when she skids. In some places there are remnants of the wire netting which was put down during the war to prevent motor transport from becoming engulfed in the sand.

The British frontier post on this road between Palestine and Syria is on the cliff of Ras-en-Nakura, the Ladder of Tyre, and Napoleon and many earlier conquerors must have looked down upon the Holy Land from the spot now occupied by a British sentry. The French post is a mile further on, and here one of our passengers is sent dolefully back to Haifa because he neglected to obtain a French visa on his passport.

Arriving at Beirut in the afternoon, we tranship into the eight-cylinder Cadillac cars of the Nairn Transport Company. No water, petrol, food, or other supplies will be obtainable for over 400 miles east of Damascus, and elaborate preparations for the desert journey are necessary. Each wide footboard supports a tank which runs the whole length of the car and carries either water or petrol. A double awning gives protection from the sun. Each car carries two spare tyres and a very extensive equipment, as well as sufficient food and drinking-water for a week, in case of a breakdown. As a further precaution the cars never travel singly, and they are so lightly loaded that if one of them gives trouble the other can take on all the passengers alone. Moreover, convoys start from each end (Beirut and Baghdad) at the same time, and if a convoy fails to arrive within forty-eight hours of the time it is due relief cars (and if necessary an aeroplane) are sent out. In wet weather Buicks take the place of the heavier Cadillac cars. Each car has a British driver, and one spare man is carried as a relief and for any emergency. An Arab guide is also taken—not that a guide is really necessary, for the journeys of the last few weeks have made a clearly defined track which precludes any risk of losing the way—but this man provides a sort of security for the good behaviour of any of his compatriots who may be encountered. He is the representative of a leading Damascus merchant, Sheikh Haji Muhammad ibn Bassam, who has great influence in the desert.

The journey from Beirut to Damascus takes about four hours along a good road, but unfortunately it is too dark for us to get the fine views of the Lebanon and anti-Lebanon, capped by the snowclad summit of Mount Hermon, which daylight would reveal. The night is spent in

a Damascus hotel, and at the first streak of dawn we are away. We are making for Ramadi on the Euphrates—420 miles due east of Damascus—but in order to effect an easy crossing of the Wadi Hauran we steer about one degree to the south of east. There is no record of this route ever having been used before. An English consular mail used to be sent by camel between Damascus and Baghdad during the 'seventies and 'eighties of last century, but it followed a straight line from Damascus to Hit, 30 miles north-west of Ramadi.

For about 30 miles the country is more or less cultivated, and we continue to see the hills of the anti-Lebanon. Then the desert begins in earnest. It is almost flat, and in that respect resembles surprisingly the desert of our childhood's imagination, except that at long intervals there are empty stream-beds and easy undulations, and still more rarely low ranges of hills. The surface is hard soil, covered in places by gravel, shingle, shale, or flints, with occasional outcrops of volcanic rock. For most of the way there are isolated patches of camel-thorn or other shrubs, and sometimes even of thin feathery grass.

From a point 20 miles east of Damascus until we reached Ramadi, we saw only one man, a Badawi, except when we met the west-bound convoy. So deserted is the country that empty petrol cases, which are of great value in a land wholely devoid of timber, remain for months in the place where they are dropped. Of animal-life, however, there is a great deal—gazelles in herds up to fifty, hyænas, wolves, foxes, hares, vultures, bustard, sandgrouse, and many smaller birds. The gazelles usually run towards the car rather than away from it, and once when we give chase for some miles and get within a yard of them they are travelling, according to our speedometer, over 45 miles an hour. Ostriches also are said to have been seen quite recently.

Except on the occasional stony patches and when crossing a *wadi*, the going is extraordinarily good, and our speed is only limited by the power of the engines. The surface of the now well-worn track is, however, not quite so smooth as the desert on each side of it. During the morning we pass from the French (Syrian) to the British (Transjordanian) sphere of influence, but of course there is no sort of guard or boundary mark to indicate the frontier. Towards evening we are linked up once more with civilization by meeting the convoy of two Cadillac cars from Baghdad. They are followed by a miscellaneous collection of eight cars, mostly Fords, which are taking advantage of the new track, though ill equipped for the desert. It will be surprising if they all get through with no breakdown, and it seems rash to embark on such a journey without special precautions.

When daylight fails we bivouac in the desert. Usually the nights are glorious, and we are unlucky to be visited by a sandstorm, followed by a little rain. The passengers take it in turn to keep watch, but more in order to reassure the ladies than from any anticipation of trouble.

We rise before dawn in the hope of making Baghdad in a day, and by sunrise we are again on the move. Rather more than halfway between Damascus and Ramadi we reach the Wadi Hauran, a stream-bed which after rain is occasionally torrential, but is now quite dry and easy to cross. In the summer this *wadi* is a regular watering-place of the Anazeh tribe, but we find it in October completely deserted. Shortly afterwards we join the furrow made by tractors to guide the aeroplanes which fly between Amman, in Transjordan, and Baghdad, entirely over territory within the British sphere of influence. We now steer slightly to the north of east, and early in the afternoon arrive at Ramadi. From this village we follow the Euphrates along the much-used, unpaved, and extremely rough Aleppo–Baghdad road, and our speed is slow. Crossing the Euphrates by the Falluja boat bridge we reach our destination at dusk.

The possibilities of the new route are great. Not only does it get London passengers and mails to Baghdad in nine days, but it enables visitors to Palestine and Syria to include the ancient cities of Mesopotamia in their tour by prolonging it for a few days. Conversely, 'Iraq is now provided with much-needed hill stations in the Lebanon and anti-Lebanon, only two days' journey away. Beirut, the Mediterranean terminus of the trans-desert cars, is of course accessible from Europe by various other routes than the one through Egypt and Palestine here described.

Through the courtesy of the Comptroller-General of the Department of Overseas Trade, we have received a copy of the regulations governing motor convoys running between Baghdad and Damascus. Before leaving Baghdad, the driver of a car must obtain a pass stating the number of passengers and amount of luggage to be carried. This will be issued from Fire Brigade Headquarters after the car has been inspected, and must be presented to the police authorities on arrival at Ramadi. No car will be allowed to leave Ramadi alone, but must make the desert journey in the company of at least one other car. No such convoy will be permitted to proceed unless it is accompanied by a reliable desert guide, and carries an adequate supply of spare parts, tyres, petrol, etc., with water and food for the journey. Breaches of these regulations are punishable under the Baghdad Penal Code. Passengers will travel at their own risk, but in case of raids or robbery the 'Iraq authorities will do their best to obtain restitution and compensation.—ED. *G.J.*

PLACE-NAMES IN THE IRISH FREE STATE

THE Permanent Committee on Geographical Names has been officially informed by the Colonial Office (Irish Branch) that the Government of the Irish Free State has communicated to the Secretary of State the following changes of name: Queenstown is henceforward to be known as Cobh, Kingstown as Dun Laoghaire, Kells (Co. Meath) as Ceannanus Mor, Navan as Baile na h Uaimhe.

So far these are the only changes formally announced. But it seems likely that others will follow, since postmarks already provide more examples: Dublin appears as Baile Átha Cliath, Kilkenny as Cill Chainnigh. Moreover, the *Irish Official Gazette* (which is printed, in part bilingually, with the Irish language in Latin characters) contains many place-names which are at the moment a little difficult to identify. The Secretary of the General Post Office (An Rúnaidhe, Árd-Oifig an Phuist) informs us that the compilation of a Post-Office Guide, which will show the names of post-towns bilingually, is in hand with a view to publication early this year. Pending this official issue, Irish names may be identified in 'Post Sheanchas,' a bilingual list of post-towns published by the Gaelic League in Dublin in two small volumes—English-Irish (1905) and Irish-English (1922).

The Permanent Committee on Geographical Names at a recent meeting decided to adopt only those changes of name which were officially communicated by the Government of the Irish Free State to the Colonial Office; to ask for the official system of transliteration from Irish to Latin characters; and to ask further that, when any change of name is communicated, it shall be accompanied by its pronunciation expressed by the R.G.S. II. System.

A study of the section "Irish" in the *Alphabets of Foreign Languages transcribed into English* (R.G.S. Technical Series, No. 2) shows that a guide to pronunciation will be very necessary, since the relation between spelling and pronunciation is nearly as vague in Irish as it is in English, and an even greater number of unpronounced letters is employed, though there is a tendency now to omit these in writing. Furthermore, the pronunciation of many letters varies in different parts of Ireland; for instance, *Evelyn* and *Eileen* are anglicizations of the same name, *Eibhlin*, as pronounced in Connaught and Munster respectively. Provisionally we may take the following as equivalents of the six place-names mentioned above (noting that the neutral vowel sound, as *a* in *marine*, *e* in *often*, etc., is represented in the R.G.S. II. System by italic *a*):

English.	*Irish Script.*	*Latin Script.*	*Pronunciation.*
Queenstown (formerly Cove)	Cóḃ	Cobh	Kōv (as Eng. *cove*)
Kingstown (formerly Dunleary)	Ḋún Laoġaiṙe	Dun Laoghaire	Dhūn Lēr*a* (almost Lwēr*a*)
Kells (Co. Meath)	Ceannanuṙ Móṙ	Ceannanus Mor	Kăn-ŏn-*us* Mawr (almost Kyăn-)
Navan	Ḃaile na hUaiṁe	Baile na h Uaimhe	Bŏl*a* n*a* Hū-*ava* (almost Bwŏl*a*)
Dublin	Ḃaile Áṫa Cliaṫ	Baile Atha Cliath	Bŏl*a* Áwh*a* Klí*a*, but in ordinary speech Bl*a* Klí*a*

English.	*Irish Script.*	*Latin Script.*	*Pronunciation.*
Kilkenny	Cill Cainnig	Cill Chainnigh	Kĭl Khánnĭg (this final consonant would be mute in the north)

It may be noted that the Irish long vowels should strictly bear the acute accent in Latin script as in Irish script; but in modern practice they are seldom so written, and the accents are omitted in the four new official names.

REVIEWS

EUROPE

Chiswick.— **Warwick Draper.** London: P. Allan & Co. 1923. 10½ × 6½, pp. xix. + 236. *Illustrations and Maps.* 25*s. net.*

THIS well-printed book is devoted to an historical account of that small district on the banks of the Thames between Hammersmith and Brentford known as Chiswick, a name probably most widely known to-day from the little adjacent island, Chiswick Eyot. After a brief account of its geography, Chiswick as a place-name is discussed. Antiquities are next mentioned, some prehistoric relics of the Stone and Bronze Ages, as well as Roman and Saxon remains, having been discovered in the neighbourhood. The author has collected a number of reminiscences of persons and events associated with Chiswick in Plantagenet, Tudor, Stuart, Cromwellian, Restoration, and Georgian times, illustrating them with numerous portraits and photographs of buildings, such as Lord Burlington's Villa, Chiswick House, Bedford House, Walpole House, and Hogarth's House. These names are indicative of the fact that in the sixteenth, seventeenth, and eighteenth centuries Chiswick was a resort of distinguished Londoners. Its situation in the bend of the river, though only 6 miles from the centre of the metropolis, gave it seclusion, and its gravel soil and open character made it healthy.

The author gives a chatty account of the most distinguished residents and visitors of Chiswick in each period, from the Dukes of Devonshire and Bedford to Griffiths Wainwright, the subtle poisoner, and Beerbohm Tree, the actor. In 1814 the fifth Duke of Devonshire entertained the Tsar of Russia, Alexander the First, the King of Prussia, and General Blücher at Chiswick House. In Queen Elizabeth's time a branch of Westminster School was opened at Chiswick, presumably on account of its healthfulness, and a hundred years later the celebrated Dr. Busby was in charge of it. Chiswick was favoured by two distinguished artists, Hogarth and Zoffany; by the famous botanist, Dr. Lindley; and by Alexander Pope, who lived there for two years. Strange to say, there is no mention of a modern poet, William Morris, who for years had a house on the Mall where the socialist intelligentzia of the day constantly foregathered. One of the most interesting inhabitants of Chiswick, who lived at Sutton Court for forty years, was the Countess of Fauconberg, Cromwell's favourite daughter Mary. She lived there until her death in 1713, fifty-five years after the death of her illustrious father, whom she so deeply mourned that her husband remarked, "My poor wife, I trow not what on earth to do with her." Two Chiswick men founded important industries in the district, namely, Charles Whittingham, the Chiswick Press, and Sir John

Thornycroft, the celebrated engineering works. There are several appendices, the most interesting being a contemporary account of the fight on Turnham Green, in November 1642, between Prince Rupert and the London Trained Bands, who worsted the cavaliers. The book is exceedingly well illustrated, but the map might have been more clearly printed. E. A. P.

The Story of Bologna.— A. Wiel. With Illustrations by M. James. (Mediæval Towns Series.) London: Dent. 1923. 5*s.* 6*d.*

The history of Italian towns during the Middle Ages is of great complexity, and the author of this historical guide has done well to treat it briefly in the main, while dwelling more fully upon such picturesque incidents as that of King Enzo. An account of the famous University is included; but the greater portion of the work is naturally devoted to the buildings and art galleries, with which Bologna is crowded.

Over the Balkans and South Russia: being the history of No. 47 Squadron Royal Air Force.— H. A. Jones, M.C. London: E. Arnold & Co. 1923. 3 *Maps and* 12 *Plates.* 10*s.* 6*d. net.*

The 47th Squadron R.A.F. earned a considerable reputation for its work in the Balkans from 1916 to 1918. In recognition of its record, it has been placed upon the permanent list of squadrons. This book was written to preserve for future members something of the spirit which, in the face of great trials, created that reputation. To achieve this end, the historical framework of the campaign has been filled in with details of individual exploits, character sketches and reminiscences, from official records and the writer's personal knowledge. The appendices contain full lists of honours and casualties. The main story is the now familiar one of the initial difficulties arising from machines and equipment, the struggle with the enemy on equal terms, and the final unchallenged supremacy in the theatre of war. One incident in the squadron's work was the bombing of the stranded *Goeben*. The Turks related afterwards how dismay gave place to contempt, so that on a return visit boats "were immediately manned *to collect the fish.*" The whole narrative is so matter of fact and light hearted that in reading it one almost forgets that its subject is war, until, perhaps, one reaches the account of the harrying of the retreating Bulgars in 1918.

ASIA

Arabien: Studien zur physikalischen und historischen Geographie des Landes.— B. Moritz. Hanover: Heinz Lafaire. 1923.

The former librarian of the Khedivieh (now Sultanieh) library at Cairo is a very learned Arabist, who has applied the results of long literary research to the actual conditions of Arabia so far as, up to the revolt of Hejaz from the Turks, he was able to learn them. Since that date he admits that he has not been in a position to keep up with the progress of discovery, and his only knowledge of, *e.g.*, Mr. Philby's explorations rests on preliminary reports in this *Journal*. Up to the moment of sending to press he had not seen the 'Heart of Arabia.' Nor again has he had anything like the data now at our disposal for southern Hejaz and Asir; this is regrettable, since much of his special study and a good half of the present volume have been devoted to the Ophir question. He places the source of Solomon's gold in Arabia, not Africa or India, and limits it to south-western Arabia—the Sabæan country generally—served by a port at 'Atr which lies north of Jeizan at the head of a long inlet, the Khor Abu-Sab', running in northwards from Ras Tarfa. This Dr. Moritz

argues from Arab authorities to have been an important harbour as late as the Middle Ages, when it served all northern Yemen, anticipating and combining the present-day traffic of Loheia and Hodeida. 'Atr is probably Ptolemy's "Athrida." Before, however, this theory can be examined critically, some information about the nature of the existing waterway and anchorages in the Khor Abu Sab', which Dr. Moritz does not supply, is to be desired. Again, he cannot say whether there are traces of any considerable ancient settlement on its shores, or from what particular inland localities gold was, or is, obtainable. Rumours of its presence in Hejaz have often come to hand but never been substantiated, although mediæval geographers believed in it. So far as the present writer knows, no locality in Asir or Yemen has yet been reported to produce it. But it need hardly be added that both our actual knowledge of the interior of these countries and the search likely to have been made yet by their natives, are so imperfect that nothing like a negative can be opposed to Dr. Moritz's speculations. They must remain in the air till we have learned more topographical facts; but, in the meantime, his collection of the literary data will be welcomed by the very considerable body of people interested in the identification of Ophir.

The earlier half of the book consists chiefly of notes on the districts served by the Hejaz railway, down which the author has travelled to see Dedan and the rock-remains generally between Medain Salih and El-Ala. There are useful botanical and zoological excursuses, as well as topographical, and in particular hydrographical. Dr. Moritz has a word to say on several problems raised by other authorities on Arabia, *e.g.* on the sand-holes or *fulj's*, and on the periods at which there were active volcanoes in the north-west. A short chapter on Nejd at the end of the first part suffers from its author's small acquaintance with Mr. Philby's work. D. G. H.

The Phonology of the Bakhtiārī, Badakhshānī, and Madaglashtī Dialects of Modern Persian.— With Vocabularies. Major D. L. R. Lorimer, C.I.E., I.A. London: Printed and published by the Royal Asiatic Society. 1922.

In 1920 a valuable addition was made to the knowledge of the Pamir dialects in Sir George Grierson's 'Account of Three Iranian Dialects—Ishkāshmī, Zēbahī, and Yāzghulāmī'—a work which, in addition to phonology, formation of words, vocabularies, etc., contains the highly important adjunct of a comparative grammar, and also a story in Ishkāshmī, which will greatly help in composition. Following upon this, in 1922, Major Lorimer gives us 'The Phonology of the Bakhtiyārī, Badakhshānī, and Madaglashtī Dialects,' thus, in the last two, extending our knowledge to dialects spoken in districts lying to the east and south respectively of those treated by Sir George Grierson. Both these works are from original investigation, the materials having been gathered from natives of the respective districts, and as few works have hitherto been published in English on this important subject, their value is evident.

Of the Bakhtiyārī dialect of Persia proper Major Lorimer treats the phonology very fully and efficiently, and supplies a copious vocabulary. On the Badakhshānī and Madaglashtī dialects, he gives phonology, morphology, paradigms, texts, and vocabularies, but scarcely what one might call an organized grammar, though a number of grammatical references are added incidentally. The work will be of value not only to philologists, but also to those who may find it necessary to gain a practical knowledge of any of these dialects, and who already know standard Persian, since in many cases the phonetic changes, as

Major Lorimer intimates, are so regular that the dialectic forms may often be deduced. An additional aid is afforded by the fact that the archaic pronunciation is frequently preserved. This, as Sir George Grierson has justly remarked, no doubt arises from the comparative isolation of these dialects and the absence of means of communication.

The author takes standard Persian as the basis of comparison with Bakhtiyārī, and the agreements and differences of the two may be easily seen by the study of his work side by side with Horn's Neupersische Schriftsprache. A few interesting examples may be cited. The first is the retention of ancient forms both in vowels and also consonants. The tendency to abbreviate is also remarkable, including the omission of medial and final letters and even syllables: Thus *d* often disappears, especially as a final; *h* generally disappears before a consonant, frequently as a final, and between vowels. In the last case the vowels often coalesce. The use of *h* as a glide, where we should expect *w* or *y*, is also noticeable.

The frequency of the change of *a* into *u* or *i*, of *ā* into *ī* or *ū* or *ŏ*, and of *ŭ* into *ĭ* may also be remarked. *Ā* too is often shortened to *a*. The occasional intrusion of *i* after *k* or *g* is probably due to neighbouring Turkish influence, whilst Arab influence appears to be traceable in the change of *sh* to *s*. The reverse of this often occurs in the development of standard Persian from the ancient forms.

Not many remarks seem needed on the Badakhshānī and Madaglashtī dialects. From what Major Lorimer tells us the latter appears to be merely an offshoot from the former, and both seem to be so similar to standard Persian as to be rather forms than dialects. Generally, Madaglashtī presents newer forms than Badakhshānī, but the contrary is sometimes found. "The change *ū* to *ī* common in many dialects of modern Persian has not been noted either in Badakhshānī or Madaglashtī." A sound nearly like the French *u* is sometimes found for *u* in both. This is probably due to Turkish influence. There is some tendency to drop final consonants, more pronounced in Badakhshānī than in Madaglashtī.

C. E. WILSON.

The New Palestine.— W. D. McCracken. With a Foreword by **Viscount Bryce, O.M.** London: Jonathan Capes. 1922. 9 + 6, pp. xiv. + 392. *Sketch-map and Illustrations.* 16*s. net.*

This volume consists of a number of articles, reprinted from various American journals, somewhat loosely put together. This origin however does not necessarily detract fron its value. Many of the papers were evidently written immediately after the events recorded, and gain much in vividness. The book represents the point of view of an American journalist, and (as the Introduction states) "is frankly favourable to the British and the work they have done in Palestine; but this point of view is here set down, not for the sake of the British, but for the sake of us Americans." It is necessary to preserve this point of view in reading the very complimentary, almost fulsome, pen-sketches of the leading British military authorities and their doings.

The personal narrative is chiefly concerned with the Jerusalem Relief Laundry established in the old Serai in connection with the "Joint Advisory Committee for Relief," and with the publication of the first English daily paper in Jerusalem—*The Palestine News.* This newspaper was founded by the same American lady—Mrs. McQueen—who acted as "Honourable Secretary" to the laundry, and who, in another chapter, is depicted as restraining by her eloquence the rioters of the "first demonstration against Zionism." For this

last she received a letter of thanks, here reproduced, from the Grand Mufti of Jerusalem. We feel we should like to know more of this lady.

Of the laundry it is sufficient to say it was a splendid means of meeting the problem of unemployment at a time of great stress. The *Palestine News* was a more remarkable production. It first appeared (9 December 1919) on the anniversary of the taking of Jerusalem, and it appears to have had a very useful six months' career as an important and non-official record of news. How great were the practical difficulties will be realized when we read that the master-printer spoke no English, and that of the four type-setters only one of them " had picked up a little English while working for the Government."

There are many sketches of the British-American social life during that period, of the Great Blizzard of February 1920, when 29 inches of snow fell, and of Oriental costumes and habits. The pro-Jerusalem Society comes in for some well-earned praise. One long chapter is devoted to Allenby's Palestine Campaigns, and one to a very fair and judicial statement of the position created by the " British Mandate."

The volume does not profess to be an historical or scientific work, and it is easy to detect small errors of fact, but as a general statement of the position of things in Palestine at the time of the British Military Occupation from an American point of view it is a welcome and useful work.

E. W. G. M.

AFRICA

The Story of the Cape to Cairo Railway and River Route.— Three volumes and Map Case. London: The Pioneer Publishing Co. 1923. £10 10*s. net.*

In these finely produced, massive, and almost too lavishly illustrated volumes we are given the story of the Cape-to-Cairo route and a good deal besides. The editor-in-chief is Mr. Leo Weinthal of the *African World*, and the associate editors include Sir Alfred Sharpe (for the Zambezi to Nile section), Mr. C. W. Hobley, Mr. W. Ingram-Lyon (who deals with mining), and Mr. Charles Rudy.

Volume i. opens with forewords by General Smuts, Lord Buxton, Sir Francis Younghusband (who notes that as geographers require the fullest possible description of the Earth's surface their work in Africa will be greatly facilitated by the building of a railway through the heart of that continent), and the editor. There follow sketches of the careers of Cecil Rhodes and Sir Starr Jameson, and then come three chapters which bring us to the heart of the matter. These are accounts, by Sir Harry Johnston, Sir Charles Metcalfe, and Mr. Robert Williams respectively, of the inception and progress of the scheme for a railway from Cape Town to Cairo—though from the first the alternative of a mixed river (or lake) and railway service was contemplated. And to-day it is possible to cross Africa from north or south almost entirely by train or steamer. Each of the three chapters deserves careful attention. Another section deals with eras of transport from the days of the voortrekkers to the days of the aeroplane. Other sections are concerned with finance, the diamond and goldfields, and the copper wealth of the Katanga. Section V., which is entitled " The Romance of the Route," goes at times far afield. It includes such things as Cape Town in the days of van Riebeck by ex-President Reitz; the passing of slavery in Africa by Sir F. D. Lugard; the great rift valley by Prof. Gregory; and the foundation of British East Africa by Mr. C. W. Hobley. Other contributors are Sir Francis Wingate, Col. Andrew Balfour, Mr. Fred Moir, and Dr. Hans Sauer. It will be seen that there is no lack of authority among the writers.

In volume ii. a number of experts describe in detail the different sections of the route. There is a mass of information designed to make the reader conversant with many aspects of the countries through which the traveller passes. For example, we have the history of the Congo and of the Anglo-Egyptian Sudan at some length, and even " An appreciation of the Sphinx."

Like the previous volumes, the third volume contains matter strictly pertinent to the main theme and matter that is ancillary. The alternative routes in the equatorial zone are discussed, and there are valuable accounts, mostly written by Mr. G. H. Lepper, of the lateral railways—such as that from Lobito Bay—upon which the Cape-to-Cairo route will depend for commercial success. (The trans-African route will be eventually, in effect, but a succession of stages linking the east-west lines.) Besides all this, there are accounts of the native tribes and the wild game found along the route.

In a separate case (which also contains the index) are a number of maps drawn for this work by Mr. A. J. Clevely. They are admirably clear and serve their purpose well. Special attention may be called to the geological and orographical maps. It should be added that the price of the work includes a fourth volume, to be issued shortly, dealing with economics and statistics.

F. R. C.

Unconquered Abyssinia as it is To-day.— Charles F. Rey. London: Seeley, Service & Co., Ltd. 1923. 21*s*.

Abyssinia—or Ethiopia as the country is called by its inhabitants—is by no means the " little-known country " which Mr. Rey calls it in his sub-title; nor is it more correct to say that " few people visit it," or that " it has been until just recently one of the most inaccessible countries of the world." Whilst this book contains much that is not new it throws light on the condition of the country since the death of Menelik in 1913, and the troubled reign of his successor. The author resided there for two periods in 1919–20 and 1922–23, and incidentally mentions that he visited lake Zwai and the Arussi Galla country, though he gives no account of his journeys or the object of his visits. The country is absorbing modern ideas and customs, and shows strange contrasts with its ancient and mediæval characteristics.

" Compare the culture of Ras Tafari and his wife, the former so advanced as to read the latest Bolshevist works, giving luncheon parties with a European menu and an excellent wine list, and then, perhaps the next day, the royal banquet of 15,000 men devouring raw meat; the railway running into Addis Ababa, and within a hundred yards a man having his hand or foot amputated for theft; native tailors working busily with the latest type of sewing machine, under the shadow of their fellow-countrymen hanging on trees in the market-place; a reception of Europeans and Abyssinians at the palace graced by cigarettes, coffee, and liqueurs, and in a field near by the priests dancing before the Ark of the Covenant; the peasants almost within Addis Ababa ploughing with the same implements that were used two thousand years ago, whilst bills are being discounted on Paris and Bombay " (p. 11).

There is much that is new in the chapters on government, trade and commerce, etc. In one on slavery and serfdom the author shows how Menelik, who signed anti-slave-trade treaties with us, himself caused the enslavement of many thousands by his raids on Gallas and " Shankala," and that the system is by no means at an end. The concluding chapters deal with foreign life and influence, the present condition of the country, and future possibilities and prospects. Although the boundaries of the British spheres march for nearly 2000 miles with Abyssinia, British interest and influence in the country are less

than those of other European powers. "The growing influences in Abyssinia seem likely to be American, Belgian, and German," Mr. Rey writes (p. 265). This is partly due to suspicions as to the designs and motives of the powers (England, France, and Italy) which have now hemmed Abyssinia in on all sides. Though foreign governments have not hitherto made the welfare of the country their first concern, the author finishes with a hopeful note that the development of its real possibilities will be advanced by co-operation between the Abyssinian and foreign governments and native and foreign groups.

The book is illustrated by a number of good photographs. F. A. E.

A White Woman among the Masai.— Marguerite Mallett. London: Fisher Unwin. 1923. *Illustrations.* Pp. 288. 21*s. net.*

Mrs. Mallett gives us neither an exact anthropological study of the Masai nor, as might possibly be thought from the title of her book, an account of experiences gained by living with the Masai. What she does do is to give a very lively account of the life of a settler, or a settler's wife, in a lonely outpost of Kenya situated in or close to the Masai reserve. It is full of colour and has all that quality of vividness which is produced by a faithful record of strange happenings when depicted by one who, as in this case, has the ability to make the reader feel that he is sharing in the events described.

The author went out to Kenya early in 1916, and for a considerable period lived close to the frontier of German East Africa; but of the campaign against von Lettow she says nothing—indeed, by the time she reached Masailand the theatre of the war was far away. But she had a trying experience of a Masai rising, during which her home was raided and all her belongings burnt. The picture she draws of the Masai, if not flattering, is sympathetic, and one may share her hope that "this brave and fearless people" will survive and profit by what Mrs. Mallett calls the march of civilization. Besides the Masai there is a good sketch of the Nandi.

The author's interest was divided, and one suspects that her love of animals was greater than her love of humanity as typified by Masai or Nandi. The book is full of accounts of the wild creatures she tamed, and of hunting adventures with all kinds of beasts—chiefly lions and leopards.

There are numerous illustrations, mostly excellent—some are too small—and an index which might easily have been better than it is. A sketch-map would have added to the value of the book. F. R. C.

AMERICA

L'Ile Percée.— J. M. Clarke. Yale University Press. London: H. Milford. 1923. 12*s.* 6*d. net.*

The sub-title of this book describes it as "being a blend of reveries and realities, of history and science, of description and narrative, as also a sign-post to the traveller." This gives an accurate indication of its character, and of the author's general style. The country with which he deals is the Gaspé Peninsula, constituting the south-eastern shore of the estuary of the St. Lawrence. Its geological structure and history are of interest, for here the northern end of the Appalachian system, laid bare by nature, exposes its secrets to the observer. In the writer's words, his account of the geological history, problems, and the changes now taking place is "merciful and very untechnical." The greater part of the book is concerned with the people of the peninsula, their origin, their history, and their life to-day. Owing to its geographical position, Gaspé has been the scene of many memorable events in the history of Canada. Along its coasts voyaged Cartier in 1534, to find shelter in Gaspé Bay and there to

take possession of the new lands for France. Two hundred years after, the French fleet, despatched too late to relieve Quebec, was destroyed by the English in the mouth of the Restigouche. Between these two dates came explorers, settlers, missionaries, and fishermen from France to impart those characteristics to the countryside which, despite the passing of French rule, still predominate. This connection has been maintained by the Jersey and Guernsey fishermen, attracted by the opportunities offered by the cod-fishery. These are the people of whom the author writes, and if at times he tends to ramble widely with much philosophizing, he redeems the fault by the enthusiasm and understanding he displays.

A Tenderfoot in Colorado.— **R. B. Townshend.** London: John Lane. 1923. 10*s.* 6*d. net.*

The opening chapters of Mr. Townshend's book call to mind those "books for boys" associated with such names as Mayne Reid and W. H. G. Kingston. Soon, however, the difference is apparent, and one obtains a first-hand account of a fleeting and interesting period in the history of the Great West. As a very tender tenderfoot, the author arrived in Cheyenne in 1869, prepared almost to believe anything of any Westerner. It was just at the time when events were moving very rapidly in Colorado. Some ten years previously gold had been struck around Pike's Peak, the first railway to enter Colorado was in course of construction between Cheyenne and Denver, and Indians still roamed the plains in full war paint. After wandering through the Rockies for some time, and incidentally witnessing the conclusion of a treaty between the Ute Indians and the United States Government in dramatic circumstances, Mr. Townshend finally settled down as a cattle rancher. The chapters which deal with his experiences during this venture are among the best in the book. The rather forced attempt at "atmosphere" is abandoned, and the author sets down instead a plain tale of the ups and downs of a rancher's life with vigour and directness, and without any striving after effect: yet in places, and especially in his moving account of the passing of the "King of the Prairie"—the buffalo—Mr. Townshend achieves real literary distinction.

Landeskunde von Chile.— **Carl Martin.** 2nd edit. **Christoph Martin.** Hamburg: L. Friederichsen & Cie. 1923. *Map and Illustrations.*

This volume contains a biography of Dr. Carl Martin, who died in 1920, and many new chapters. There is an index, bibliography, map (scale 1/5,000,000), and 141 excellent illustrations which indeed give a better idea of the country than those of any other book known to the reviewer.

The geography, geology, and mining industry have been written by Dr. Bruggen: one finds the altitudes of almost every mountain and of every pass through the Andes. He suggests that a slight rising of the coastline, of which there are some indications, may coincide with a local depression of a similar amount on the western side of the Andes.

The Chilean glaciers are described in detail; the constant wetness of the climate, with no summer warmth or drought, explains the fact that such glaciers as that of the Cajon de la Piedra reach the ocean in a latitude equivalent to that of Corsica. On both sides of the Andes the glaciers are, however, now in retreat. So there is to-day either a smaller rainfall or a higher temperature than that of the time of extreme glaciation. The "rivers of stones" in the Falklands, which are probably moraines, suggest a formerly greater elevation of the Patagonian Andes. But the climate in preglacial times and in the interval between the first and second Patagonian glaciation seems to have been

even warmer than that of the present time ; remains of Fitzroya and other plants of the Chiloe island flora have been found in the peat of Tierra del Fuego.

By some fortunate inspiration, the editor has induced Herr Hans Gundermann, a landed proprietor and practical farmer, to describe the varied kinds of agriculture practised in Chile from systems almost neolithic in their simplicity to the modern dairy farms in Middle Chile where the latest applicances are used, and the yield of milk per cow is probably equal to that in most parts of Europe. In the south, during the winter, cattle are left to graze in the woods upon the leaves of Eucryphia, Eugenia, and especially on the bamboo-like grass Chusquea : they are brought to the grassy stretches of burnt forest only in summer-time. With such advantages, one wonders that Chilean agriculture is not more prosperous than it appears to be. But sheep have to be folded every night to prevent loss by robbers, and the four-horned sheep of prehistoric Iberian times is still bred in Chiloe. Herr Gundermann's contribution is of great value to the general history of agriculture and colonization.

Dr. Christoph Martin's new chapters deal with population, industries. Church and State, and he has also rewritten the special description of all the provinces of Chile.

This weighty book of 786 pages is, in fact, an Encyclopædia of information about Chile. Thus one finds that the war has stimulated home manufactures ; that the United States and Britain together make up more than half of imports and exports ; that Germany stands third in importing and fifth in exporting countries. In 1917 there were over 20,000 persons of German blood in Chile ; they owned over one million hectares in the Valdivia Llanquihue district alone. In short, one can find recent information about almost any subject affecting Chile. So, to give only two examples, we learn that there are ten political parties in Chile, including four separate varieties of Liberals ; and that compulsory education was first introduced in 1920. G. F. S. E.

AUSTRALASIA

A Land of Opportunities.— E. J. Stuart, J.P. With an Introduction by **Norman Malcolm.** London: John Lane. 1923. Pp. xiv.+144. *Illustrations and Maps.* 10*s.* 6*d. net.*

This book is an account of an expedition made by Mr. E. J. Stuart in 1917 to explore the north-west coast of Western Australia, prospect for minerals, report on the natural and trade resources, and, at the same time, to take cinematograph records of his investigations. In his introduction Mr. Norman Malcolm describes the narrative as "a plainly told story from a plain-spoken man." That is well enough : one does not look for great literary pretensions in a man of action such as an explorer, and some of the greatest records of travel have made their appeal through the simplicity of the language in which they were written. When, however, it becomes apparent that Mr. Malcolm prepared the book for the press from Mr. Stuart's diary, which was not, in all probability, written for publication, one may be excused for complaining that he did not perform his task with more care. Had he done so he would have been able to adjust innumerable lapses of grammar, he would have broken up paragraphs which sometimes extend to over three pages, he would have added an index, and he would not have allowed a reference in the text (p. 65) to a photograph which does not appear in the book.

These things, however, do not affect Mr. Stuart's achievement, or the interest with which many will read the narrative of his journey in a schooner along the unfrequented coasts of the Northern Territory from Broome to Wyndham and

back. It was a journey which definitely established the mineral wealth and agricultural possibilities of this vast, fertile, and little-known area, which has a climate "so mild that you could use the sky as a roof all the year round," and is at present peopled mainly by wild blacks and a few scattered missionaries.

These natives, although shy, usually responded to the author's tactful overtures, and in one of the many magnificent photographs with which the book is illustrated he almost seems to vindicate Louis de Rougemont by showing a black boy riding a large turtle. Throughout the book the camera supplies the corroborative evidence for the statements made, which the narrative of de Rougement lacked. Mr. Stuart himself writes with great modesty, making little of the dangers the expedition ran; his statements are confined to his personal observations, and he avoids theories. The book ends with a passionate appeal, entitled "Eyes off," and signed "Seer," that the Australian should reap the fruits of Mr. Stuart's labours rather than see his birthright "pass into the hands of his black brother Esau." O. R.

MATHEMATICAL GEOGRAPHY

Earth and Sun: an Hypothesis of Weather and Sunspots.— E. Huntington. With a chapter by **H. H. Clayton.** New Haven: Yale University Press. London: H. Milford. 1923. 23*s. net.*

This is a companion volume to 'Climatic Changes, their Nature and Causes,' reviewed in the *Journal* for October last. It is a compilation, by a well-known geographer, of material lying rather outside the range of his first-hand knowledge: and we must say with regret that it seems to us unsatisfactory.

The book contains an enormous mass of undigested material, many diagrams, and numerous tables of data and of correlation coefficients, which make it difficult to read, and demand sustained attention. It displays a great deal of loose thinking, and contains little that is accepted as uncontroversial. Such a well-known solar relation as the sunspot variation with the diurnal range of the horizontal component of the Earth's magnetic field finds no mention. The topics discussed are chiefly the possible effect of sunspots on the terrestrial atmospheric circulation, the paradox of a hot Sun and a cool Earth, electrical effects of the Sun on the Earth, and the planetary hypothesis of the origin of sunspots. In treating the relations between sunspots and terrestrial temperature, the author copies from Humphreys a diagram (Fig. 1) which gives for the period 1870 to 1915 the sunspot numbers and the mean temperature departures, which "show clearly that the Earth's temperature rises when sunspots are few, and *vice versâ*." But an examination of the diagram shows that in 1870, when the sunspot number was higher than at any time since 1750 (and possibly earlier), the curve of temperature departures from normal crosses the axis, showing that temperature conditions were normal in the most spotted year. Again, at the sunspot minimum of 1912, the temperature curve shows a well-marked minimum and not the maximum which should be attained according to the author. Thus an examination of the first diagram in detail does not bear out what the author says of it.

Towards the end of the book Prof. Huntington develops the planetary theory of sunspots, and concludes, on evidence which the present reviewer regards as entirely unconvincing, that the main sunspot periodicity may be regarded as produced by the disturbing effects of Jupiter and Saturn. A curve due to E. W. Brown is reproduced and compared with the sunspot curve, and

a coefficient of correlation between the two curves is evaluated. The coefficient of correlation for the period 1750–1900 is given as 0·457, which is 10·6 times its probable error. The author says "it literally means that there is only one chance in billions that the apparent resemblance of the curves is accidental." We may admit the relationship is not accidental, yet it need not for a moment be regarded as proving a causal relation. The resemblance is not accidental, because these two particular curves were chosen deliberately. Had the author chosen any other curve with a period round about eleven years, then so long as it coincided in phase with the sunspot period near the middle of the range, it would naturally give an appreciable coefficient of correlation with the sunspot curve. The author quotes a discovery made at Mount Wilson in 1912, and confirmed this year, that there is a reversal in sign of polarity of spots in consecutive sunspot periods. This in itself makes it difficult to accept a dynamical theory of sunspot periodicity.

The author quotes a considerable amount of observational data in some of his tables, but seldom gives references to the source from which they are taken. Some of the data ascribed to Kew in Table 19 belong in reality to Greenwich.

The book has no particular value either to the meteorologist or the astronomer, neither can it possibly appeal to the general reader.

D. BRUNT.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

Animal Life in Deserts.— P. A. Buxton. London: Edward Arnold & Co. 1923. 9×6, pp. xvi.+176. *Illustrations.* 10*s.* 6*d. net.*

Mr. Buxton had the opportunity of spending a considerable time in the fascinating surroundings of the hot desert of the Old World, and he turned his attention to the study of animal life in that specialized environment, in Lower Mesopotamia, north-west Persia, Algeria, and Palestine. After some chapters on desert climate and vegetation the author describes the animal life of the deserts, discussing the habits of various animals in relation to their environment. Some of the most interesting facts in the book relate to the food and the colour of desert animals, and tend to demolish several of the treasured theories of utilitarian biologists. From Palestine and Central Australia and other parts of the desert there is evidence that camels eat spiny Acacias, the thorny Capparis, and plants that are believed to be bitter or nauseating by reason of bark or smell. Squirrels and mice readily devour prickly pear fruits covered with minute barbed hairs. Mr. Buxton believes that thorns and spines were developed in the first place as a response to a dry atmosphere, and not as a defence. He cites much evidence in favour of this view. The theory of protective coloration does not tally with the facts of desert life. It is true that many desert animals are sandy-coloured, but others are black, and in any case no coloration can be protective to nocturnal or subterranean animals, or to animals without large or powerful enemies. It is perfect immobility rather than any particular colour that makes an animal invisible. Mr. Buxton thinks that the protection theory covers only a small proportion of the facts, that the explanation of the general depigmentation of desert animals will be found rather in studying the effects of physical conditions upon animal life. Certainly the theory of protective coloration is one that needs re-examination in the light of field experience, for it has been pushed to extremes by armchair zoologists. An examination of the colours of polar animals also throws grave doubts on its general acceptability, but Mr. Buxton's volume does not deal with the life of cold deserts.

R. N. R. B.

GENERAL

The World as seen by Me.— T. Simpson Carson. Pp. 352. *Illustrations.* London: Heath Cranton, Ltd. 1923. 30*s. net.*

An inveterate globe-trotter, the author has wandered up and down the world for many years, visiting most countries, but seldom, we gather, straying far from the beaten tracks. He has observed widely but not deeply, and has written an entertaining volume stored with much information and relieved with frequent flashes of humour. The pages show a liberal disregard of grammar and an absence of literary style. Mr. Carson's progress is meteoric: he rushes us from one scene to another with random notes on any topic that occurs to him, pausing for a few pages only when he writes of natural history, which would appear to be his special interest. He finds a grievance in the many languages and distinct currencies of Europe, but in other respects seems to have enjoyed himself wherever he went. It is a pleasant book for an idle hour, but cannot be said to have any lasting value. The photographic illustrations are less striking than the several excellent colour plates of plants and insects, but most of these have no reference to the text. R. N. R. B.

Cambridge Geographical Text Books (Senior).— G. F. Bosworth. Cambridge University Press. 1922. 8×5½, pp. xiv.+508. *Diagrams and Illustrations.* 7*s.* 6*d. net.*

The third of a series of text-books "on the concentric system," this volume has been prepared to cover the ground for examinations in higher forms of central and secondary schools. After some brief introductory chapters on maps and physical geography, the countries of the world are treated by political units, a method which shows to least advantage in the case of Africa, where, in spite of a preliminary chapter on the continent in its general aspects, it merely emphasizes the incoherence which a political map of that continent suggests. But in Europe and perhaps America there is a good deal to be said for this method of treatment. In each country the same arrangement is followed, but some states are treated more fully than others. The book is well written, amply illustrated by photographs and maps, and beautifully produced; but one may reasonably doubt if this kind of descriptive geography, with little causal treatment, will prove attractive to pupils. The stage is set, the people introduced, their activities and trade are duly catalogued, and we pass on to the next country. Knowledge in this guise is apt to be dull and mentally indigestible. Moreover the extreme condensation which crowds the world (less polar lands) into 500 pages is liable to lack proportion and lead to generalized statements of doubtful value. "The cold Arctic winds sweep over this country (Siberia) as there is no mountain barrier to stop their progress." "In the far north are the treeless tundras yielding fossil ivory." "The mass of the people (in Siberia) belong to the Greek Church, but the native Samoyedes are heathen." These three examples from one section show the dangers of compression. A few statements should be corrected. On p. 33 Antarctica should be included among the continents; on p. 72 the paragraphs on Mediterranean winds might be revised; Hammerfest is not a centre of whaling, and Tromsö, which is not noted, is more important. There is much difference in fertility between the "rich meadow lands of England, Denmark, and Holland." The spelling of some of the place-names might be revised. Taken as a whole the book might be improved, and is worth improvement: in its present form it scarcely fulfils the aim of the author. R. N. R. B.

THE MONTHLY RECORD

EUROPE

The Floods of the Simeto Basin, Sicily.

THE plain of Catania, which stretches south-westward of the city, consists of alluvium brought down from the mountains by the Simeto and its big confluents the Dittaino and Gornalunga, and, like other such tracts in highly mountainous environment, is particularly liable to inundations in wet weather, which assume serious proportions on an average every few years. The subject is discussed by Prof. F. Eredia in the *Annali del Consiglio Superiore alle Acque*, 1923, vol. 5, Fasc. 1. In this plain, as a typical Mediterranean locality, the season of rainfall is confined very sharply to the months October to April inclusive, but high up in the mountains, in the upper basins of the Simeto, Dittaino, and Gornalunga, the season is prolonged through the early summer into July. During July and August, which are rainless at the mouth of the river, sudden local cloudbursts (" acquazzoni ") are not very rare on Etna and the contiguous ranges, and are sometimes reflected in a sudden rise in the water-level on the lower river when no indications of rain are there observable. The period during which the floods occur is practically confined to the winter months October to March. That they are less frequent in spring or early summer when the snows of Etna are melting, is attributed to the fact that the snow-water permeates the lavas and reappears below in springs. To this circumstance, as well as to the prolongation of rainfall into midsummer in the higher basin, must be attributed the abundance of water in the Simeto available for irrigation in the plain during the dry season. The fifteen floods of the years 1904 to 1920 are discussed in some detail with the attendant meteorological conditions. They are classed in three groups: those due to heavy rains over the entire basin, those due to heavy rains in the mountains only, and those due to persistent heavy rains in the plain and lower valleys, the last being occasioned when a culminating downpour follows a wet spell which saturates the soil. The maximum water-level shown by the gauge at Passo Martino occurred during the flood of 22 November 1915, when much damage was done in the plain of Catania, and nearly 10 inches of rain fell in a couple of days. The rains which occasion these inundations occur typically when a shallow barometric depression forms in winter over Algeria, and instead of passing eastward to the Ægean is diverted northwards by high pressure over south-east Europe.

Greater Stockholm.

In the *Geographical Review* for October 1923 Prof. Sten de Geer gives what he terms a geographical interpretation of Greater Stockholm, illustrated by plans showing the location of the business and residential quarters, the means of communication, and so on. Owing to its favourable position at the outlet of lake Mälaren, and the crossing of land and water routes, Stockholm outdistanced its rivals in the Mälaren plain at an early date, and has been the chief centre since the middle of the thirteenth century. The actual position is defined by a northward-facing fault escarpment (Södrabergensbrant), the line of which is continued eastward by a bay of the Baltic and to the west by an arm of lake Mälaren, the main waterway of Central Sweden. Where a north–south gravel esker crosses the depression in front of the escarpment a lock (Slussen) has been made joining the lake to the Baltic. North of the lock is a rounded flat esker hill (Stadsholmen) where the old city grew up, bounded to the north by the river Norrström, the natural outlet of lake Mälaren.

In certain sections the plan still shows the old system of triangular blocks, while the slopes of the oval esker are occupied by two to three parallel longitudinal streets with long narrow intervening blocks. Along the foot of the hill ran the city wall, outside which two successive belts were developed by the end of the sixteenth century. Two subsequent periods of extension date from 1635 and 1866 respectively, and the later spread outwards has not been concentric with the city nucleus, but has been chiefly along the lines of communication. The total population of the outer districts (which are divided into several sectors by bays or sounds forming natural traffic divides) is only 105,000, while the inner residence region has 370,000. The limit between the outer and inner part of the residence region is extraordinarily sharp, the density *increasing* outwards towards the boundary of the compact region, and then suddenly giving place to the surrounding uninhabited districts. In this respect it affords a parallel with Königsberg. The main tram-lines converge on three principal centres between which lies Gustav Adolfs-torg, the organic centre of the city. Till comparatively recently old Stockholm, the city between the bridges, was the centre of business and administration, the radiation of all steamboat lines from the old city being then of more importance than now. The great development of tram-lines has since favoured the removal of business to lower Norrmalm, where also end the suburban railway lines to the outer residence districts. The central business district covers an unusually large proportion of the whole, partly because of this removal of the centre (the old city still remaining a part), partly because the central portion about the esker in Norrmalm has not been intensively utilized. A study of the distribution of different branches of business shows that while some are localized in single areas, others are distributed between three distinct centres.

ASIA

Mr. Weatherbe's Journey through Chinese Tibet.

We have received from Mr. D'Arcy Weatherbe some details of his journey through Burma and Yunnan, and an extract from the *North China Daily News* of 31 October 1923, which describes his adventures with Chinese brigands at considerable length. Mr. Weatherbe left London on 2 March 1923, and reached Calcutta *viâ* Constantinople, Baghdad, and Basra. Here, in preparation for his expedition to the Amne Machin and the high peaks south of the Koko Nor region, he was fitted out with the necessary instruments by the Survey of India. The route which Mr. Weatherbe followed coincided to some extent with that of Captain Kingdon Ward in 1922, described in the *Journal* for July 1923, which contains also a sketch-map of the region. From Rangoon he ascended the Irrawaddy to Myitkyina, and thence went by mule transport through Fort Hertz to Pangnamdino [? Paangnang Ga], on the Nam Tamai. Turning eastwards and following the northern banks of the Nam Tamai and Taron rivers, he reached Mondam [? Monghawng], passing *en route* close under the magnificent waterfall, some 400 feet high, which drops in one stage apparently sheer into the Taron, near a native spot called Hkampang Wang. From here onwards he met with increasing difficulty in obtaining porters, though the carriers behaved very well on the journey across the Yuragan pass, through snow and sleet, which brought them into the Salween valley and Bahang. From Bahang Mr. Weatherbe crossed the Si La pass—where, though it is considerably higher than the Yuragan, there was not so much snow and the going was better—to the mission at Tzeku on the Mekong River. Journeying up the river and through Atuntze he arrived

at Yakalo in southern Tibet, to find further progress northward *viâ* Batang impossible by reason of Chinese bandits and Tibetan revolutionaries. Accordingly, he took a more westerly route towards Gartok, in Kam, hoping to reach the Koko Nor by Gonjo and Beyu. On his way thither, however, he was stopped by Tibetan officials, who wished to communicate with the Kalon Lama at Chamdo before allowing the party to pass. As permission to proceed was unlikely to be obtained, Mr. Weatherbe had to abandon all hopes of reaching Koko Nor and return to Tzeku, where he arrived on July 1. Mr. Weatherbe now decided to set out for Tali, in Yunnan, distant about a fortnight's journey. On July 8 he arrived at Weisi, where he spent several days changing his mules and arranging for an escort through the brigand-infested country to the south. Finally he was accompanied on his way by four Chinese militia-men, that is, four coolies provided with arms and uniform for the occasion. After three days of very hard travelling—owing to the flooded condition of the Yangtze valley they were obliged to keep to the high rough ground—they were approaching Kienchwan when they were attacked by a large band of brigands. The escort was soon put to flight and Mr. Weatherbe taken prisoner. For nearly a month he was forced to accompany the band on its plundering expedition, during which time he suffered much from lack of food, illness, and the filthy conditions which prevailed. He was then taken to a stronghold about three days' journey from Tali, while negotiations were opened for his ransom. The brigands desired, in exchange for him, a government amnesty for themselves and others to the number of one thousand, with an equal number of rifles and uniforms, the whole to be placed as police in charge of ten local sub-prefectures! Weak though he was, Mr. Weatherbe determined to escape, which he succeeded in doing on the night of August 13. After some trying experiences, on the 15th he fortunately fell in with a military patrol, part of the forces sent out against the brigands, which took him to Tali. The following day the band, which had seized a French priest as a hostage for Mr. Weatherbe, was broken up by the soldiers and the priest set free. During his imprisonment the brigands had treated Mr. Weatherbe with some consideration. As his mules were proving a source of delay, he was allowed to send some of them to Tali. In this way he was able to save his journal, notebooks, and films, the complete record of his journey from the Irrawaddy. Having recuperated at Tali, he was sent off to Yunnan under a stronger escort, where after further skirmishes with robbers he arrived on September 16.

Roads in French Indo-China.

Remarkable progress has been made in French Indo-China during the past few years in improving communications by means of roads traversable by motor vehicles. The most striking results are perhaps those which for the first time give easy access to the Laos country on the upper Mekong—hitherto almost entirely cut off from the outer world by the mountain range which separates it from the seaboard of Annam. A clear account of the roads and their probable influence on the development of the Laos country is given in the *Annales de Géographie* for September 1923 by Prof. J. Brunhes, who visited Annam last year, travelling over one of the new roads. Thanks to the energy of the French officials in these parts, and the enlightened support of the acting Governor-General, M. Baudoin, three motor roads have already been opened between the sea and Laos, and whereas until last year that region could only be reached from Hanoi, capital of French Indo-China, by a journey of about twenty-five to thirty days *viâ* Saigon, it can now be reached in two. The

most southern route leaves the coast at Dong-ka, reaching the navigable waters of the Mekong at Savannaket. Although the trace and surface are both good, it is perhaps the least important of the roads, as it traverses the largest extent of uninhabited country, and its terminus is a purely administrative centre. The central road starts from Vinh, terminus of the coast railway from Hanoi, and, passing by Nape, reaches the Mekong at Thakhek in a distance of only 280 kils. It crosses the mountains by the Keo Newa pass, following a route first surveyed by the explorer Pavie. The third road also starts from Vinh, but runs north-west by the valley of the Song-ka to Chieng Khwang in the important province of Tran-Ninh, noted for its mineral wealth. In course of time it will be extended to the Mekong at Luang Prabang, with a branch southward to Vientiane on the same river. It was the central road that was traversed in its entirety by Prof. Brunhes, and he gives an admirable description of the physical character of the country and the life of the people. Six zones of varying character are defined. (1) The alluvial plain is cultivated intensively with rice. (2) The crystalline foothills, partly jungle-covered, show more varied cultivation, including (in the higher parts) the coffee plantations of several enterprising colonists. In these two sections the road crosses rivers, the passage of which has so far to be effected by ferries. (3) The granite range forming the backbone of French Indo-China, though of no great absolute elevation, forms an important climatic and economic parting; it is covered with an almost impenetrable tropical forest. (4) A zone of clay-formation follows in which the Lao people first make their appearance, dwelling in huts raised on piles. The forest here becomes more open. (5) A zone of sandstone forms plateaus of about 550 metres, and is in some ways the most attractive country of the whole. The forests consist largely of pines, the rivers flow in deep channels, and the fauna includes deer, elephant, tiger, jungle fowl, and gibbon. (6) The last zone is of limestone, with a confused and partly subterranean water system and a surface composed of rock masses through which the road finds a way with difficulty.

From the other extremity of French Indo-China comes the announcement of similar progress in road-making. In his report dated September 1923, an extract from which has been kindly sent us by the Department of Overseas Trade, H.M. Consul-General at Saigon says that it is now possible to proceed from Saigon to Hanoi overland by a regular public service of motor cars. It is also possible to journey comfortably by motor from Battambang in Cambodia to Langson on the China frontier—a distance of 1606 miles. By the end of 1923 it would also be possible to reach the ruins at Angkor from Saigon by similar means.

Dr. McGovern's Visit to Lhasa.

In the late summer of 1922 a "British Buddhist Mission" of five persons, with Dr. McGovern as "scientific adviser," obtained leave of the Indian Government to proceed to Gyantse, and then ask permission of the Tibetan Government to visit Lhasa. This request was not granted by the Tibetan Government, and the mission returned to India. Dr. McGovern then resolved upon a bold but discreditable stratagem. Having obtained a pass to visit Sikkim, on which was plainly stated that the holder was "not authorized to enter Nepal, Bhutan or Tibet," and "shall not visit any place or travel or attempt to travel by any route other than that indicated" thereon, he crossed the frontier with a few followers, and in some sort of disguise made his way to Lhasa, whence, after a stay of some weeks spent more or less in confinement in a house in the town, he returned to India.

A somewhat high-flown account of his adventures has been published in the *Daily Telegraph* in weekly instalments during last autumn. It was hardly to be expected that a journey undertaken under the conditions described above should provide material of any value to the serious student. And whatever little value the story might have possessed is discounted by Dr. McGovern's obvious predilection for sensational journalism. Those acquainted with the little village of Kalimpong, prettily situated on a spur of the outer Himalayas in Bengal, and famous as the scene of a great Scottish missionary enterprise, will merely smile at his reference to "a secret visit to the city of Kalimpong," as also will all who are familiar with the history of mountaineering in the Eastern Himalayas, at his surprising statement about Kangchenjunga, that "every one who has seriously attempted to scale its summit has never been heard of again." Dr. McGovern's description of Tibet as "the mysterious unknown country" was as rash as it was foolish in view of Sir Charles Bell's recent stay of nearly a year in its capital city, an account of which he has recently given at a meeting of the Society, and which is published in the present number of the *Journal*. Even more amazing is his reference to Lhasa as a city to which "entrance by adventurous explorers had been sought in vain" in view of the fact (of which he must surely have been aware) that General Pereira had quite recently travelled there from Peking. Finally, the cheerful friendly people who are so helpful and hospitable to the Mount Everest Expedition become in Dr. McGovern's narrative "natives fiercely jealous of every intruder" and "an angry populace which bars the way and insists under pain of death on an immediate return."

Quite apart, however, from the merits or otherwise of Dr. McGovern's story, the affair has a certain gravity. Though he declares that he "escaped having to commit himself to anything," and that he was "heading for the passes without having signed the guarantee," the fact cannot be denied that his permit for Sikkim expressly forbade hin to enter Tibet; and that when he did so it was in defiance of the wish of the Dalai Lama, in disobedience to the orders of the Government of India, and in contempt of the conditions under which he received his pass. Such conduct does great disservice to good relations with Tibet and to travellers with legitimate hopes to travel there, and it gets innocent people into trouble. Dr. McGovern is not ashamed to boast that the frontier police were "brought down to Gangtok, court-martialled, and ignominiously dismissed" as a result of his cleverness. He thus stands self-condemned.

The Earthquake in Japan, September 1923.

Our attention has been called to a slight mistake in the note on the great Japanese earthquake of last September inserted in the October number of the *Journal*. It was stated that the "Imperial Library" had lost 700,000 volumes by the disaster. This should have read "the Library of the Imperial University." We understand that a representative of the University has arrived in England with a view to making a special appeal for books to replace those lost, and we feel sure that this will meet with a sympathetic response wherever possible.

AFRICA

Captain Angus Buchanan's Journey across the Sahara.

Our readers who enjoyed Mr. Francis Rodd's recent account of "A Journey in Aïr" (*G.J.*, August 1923, pp. 81 *et seq.*), will be interested to know more

of that attractive though desolate country, and will welcome the opportunity of seeing it, and a great extension of the journey, as represented in the travel film which Captain Buchanan is showing in London. His main purpose was collecting, and there are excellent pictures of the animals and birds of the country, with some striking scenes in the remarkable mud-built towns from Kano northward, and the now almost deserted stone-built villages of Aïr. The film is perhaps somewhat overburdened with "titles," and it strengthens the feeling that a travel film should always if possible be accompanied by a lecture: which, however, is probably not commercially practicable. But the problem of making travel pictures at once educational and attractive to the public is still in the experimental stage, and particularly interesting to geographers, who will wish every success to this and other enterprises now making a determined effort to interest the great "picture" public in exploration and travel.

The Scientific Services of Egypt.

The 'Report on the Work of the Physical Department for the year ending 31 March 1923' (Ministry of Public Works, Egypt) contains, as usual, a most instructive and inspiring account of the scientific services which a well organized and equipped department can render the State; and especially a State such as the Kingdom of Egypt, whose prosperity depends on the Nile. The effective use of the Aswan reservoir requires frequent forecasts of the low stage of the river, so that water may be released as early as is possible with safety. To meet the needs of this service there are 281 rainfall stations in and around the Nile basin, 79 lake and river gauges, and 15 river discharge stations. Much work has been done by the hydrological service in current-meter rating, in evaporation and sounding experiments, and study of the discharge of sluggish streams. The meteorological service, time service, and control of weights and measures, are all of the highest standard, and every page of the report shows how the prosperity of the country is bound up with its scientific services. But the European staff which has built up this service is already in process of dissolution, and in three years the last will have gone. Much has been done in the last few years to train an Egyptian staff: but the time is short, and the Ministry of Public Works will do well if they can maintain these all-important services at their present efficiency during the period of dislocation.

The geodetic section contains an interesting proposal for connecting the triangulations of Europe and Africa by way of Crete and Sollum, which are 120 miles apart, and not intervisible. A geodetic camera has been designed and is under construction in the Department's workshop, and balloons fitted to detonate a magnesium flash at a great height have been tried at Helwan. If several such cameras could be mounted at stations in Crete and on the African coast, to record simultaneously the positions of flashes in mid-Mediterranean, it might be possible to make a connection analogous to that obtained by the intersection of inaccessible Himalayan peaks from north and south of the range. It is a bold and attractive scheme for the extension of geodetic work over distances hitherto considered impracticable, and the results of the trials will be awaited with high interest.

Railways in East Africa.

Considerable development of the railway system of East Africa has been recently sanctioned by the Colonial Office. In Kenya one of the first results of the Imperial loan for colonial development will be the extension of the

Uasin Gishu branch of the Nairobi–Kisumu railway from its present rail-head at Eldoret through Turbo to the Uganda frontier. The Uganda authorities have also undertaken to link this line up with Jinja, the point where the Nile leaves Lake Victoria. The completion of this scheme would place Uganda in direct rail communication with Mombasa *viâ* Nairobi. At present traffic goes by lake steamers to Kisumu and on by rail. It has also been decided to re-lay the track of the Uganda Railway between Mombasa and Nairobi in order that heavier loads may be carried. The opening of this route will have beneficial results upon cotton-growing in Uganda and Kenya, and also upon the more recently developed maize cultivation. The building of plant for the grading and drying of maize at the port of Kilindini, on Mombasa island, is under consideration. Railway development on the Kenya–Tanganyika frontier includes the taking over by the Kenya Government of the Voi–Taveta–Kahe line. Voi is on the Uganda railway and Kahe on the Tanga line. The decision not to pull up this line, which was built for military purposes, will provide an outlet for the fertile Moshi district through Kilindini. The same purpose will also be served by the extension of the Tanga line to Arusha. In southern Tanganyika, the extension of the Lindi light railway, which serves a rich plantation district, with considerable production of sisal hemp, has also been authorized. A scheme for the development of the harbour facilities of Dar-es-Salaam is being discussed, but it would appear that the claims of Tanga are being strongly urged in opposition.

POLAR REGIONS

The Open Water at the Head of Baffin Bay.

Under the title of "Significant Ameliorations of Present Arctic Climates," Mr. T. C. Chamberlin discusses two "oases" of relatively mild Arctic climate, one at the landlocked end of Baffin Bay, and another, less noteworthy, on the west coast of Greenland, between 63° and 73° N., the two being separated by the inhospitable Melville Bay (*Journal of Geology*, vol. **31**, July–August 1923). The Baffin Bay oasis is the home of a tribe of Eskimo known as the Arctic Highlanders, and contains a rich fauna and flora of the Arctic type, while the more southerly oasis is occupied by the Danish Colony of West Greenland. The area of the head of Baffin Bay on the Greenland side has long been known to Arctic explorers as the "North Open Water," and is referred to by Peary as "one of the most interesting of all Arctic localities," and as "a little oasis amid a wilderness of ice and snow." The inhospitable tract of Melville Bay is due to a blockade of ice collected in Smith, Lancaster, and Jones Sounds, and borne by a current which, deflected by the Earth's rotation, flows along the west side of Baffin Bay to join the East Greenland current as the Labrador Current. The two "ameliorated" areas, one to the north-west, the other to the south-east, of Melville Bay, must obviously be due to relatively warm water, the origin of which the writer endeavours to trace. He holds that this persistent warm water is of Atlantic origin, and that it flows under the ice-laden currents, rises to the surface first along the west coast of Greenland, and later at the head of Baffin Bay, where it is concentrated and pressed to the surface. This water though relatively warm is also relatively saline, and so denser than the cold ice-laden water under which it passes. The argument rests upon a wide survey of what is known of the distribution of temperature and salinity, and of the stratification of the waters of the entire North Atlantic and North Polar regions, as well as of the effect on the circulation of the salient features of submarine morphology; and even if it should not be accepted as proved, it is useful as

directing attention to an interesting question. It is submitted that the saline Atlantic water which strikes northwestwards towards Hudson S belongs to the middle layer of that ocean below the warm but less sali Drift, and above the cold abysmal waters, and that by carrying its h high latitudes under cover, the effect when it eventually comes to the su greater than if, like the Gulf Drift, it were constantly spreading out and heat at the surface. It is held that for this reason the Gulf Drift has a smaller effect on the climate of Spitsbergen and Franz Josef Land than the w water in the north-west corner of Baffin Bay has on this area. No climatolog statistics or actual personal experiences, however, are given to support comparison, and in any case it is well known that Spitsbergen is distinctly rigorous than most parts of the polar basin.

Mr. Chamberlin states that he visited south Greenland in July 1894 what he understood to be normal conditions, and was satisfied as to the co tinuity of the surface ice-laden streams past Cape Farewell to the exclusion any warm *surface* current from the Irminger current as depicted on som maps. He thinks that this warm surface flow is abnormal and present onl occasionally in certain seasons with unusual winds.

GENERAL

Proposed New Oceanographical Expedition.

A far-reaching proposal for the extension of International Oceanographical Research was submitted by Prof. O. Pettersson and Commander C. F. Drechsel to the International Council for the exploration of the Sea at its meeting in Paris in October 1923, in a Memorandum since issued as an extract from vol. 32 of the Reports of the Council (Copenhagen : A. F. Høst et fils, December 1923). It is pointed out that the result of the International Research already carried out is to show that there exists an interchange of waters and of living organisms between different parts of the ocean on a far larger scale than was considered possible twenty years ago, exemplified, *e.g.*, by the new facts brought to light respecting the migrations of the eel. Such discoveries suggest further problems for solution, and of these two are put forward as of special importance, namely : (1) Whether the changes observed in the fish-life correspond to changes in the current system of the ocean ; (2) whether these changes are periodic. From the study of the first it should be possible to determine whether the migrations of fishes are physiological, *i.e.* due to what is usually spoken of as instinct, or whether they depend upon physical conditions. An answer to the second problem would help towards a forecast of the monthly and yearly output of fisheries. While the normal work of the International Council must be kept within certain limits, concentrated, *e.g.*, on the upper layers of the sea to a depth of not over 1000 metres, wider investigations must be reserved for special expeditions. It was hoped that the opening of the Panama Canal would afford the opportunity for concerted research in the Atlantic by the ships taking part in the ceremony, but the war frustrated the plan. Now, it is pointed out, a new opportunity presents itself through the offer for sale of *L'Hirondelle*, the yacht of the late Prince of Monaco, fitted up for oceanographic research in the most complete manner possible. It is proposed that this should be acquired for an expedition embracing all the oceans and lasting perhaps four years, the total cost being reckoned at from £120,000 to £140,000—a sum which, it is held, could be provided by the co-operation of all the countries interested. General approval of the scheme on the part of the International Council was expressed in a resolution passed during the Paris meeting.

Course of Lectures by Prof. A. P. Brigham.

A course of three lectures will be given at the London School of Economics on February 22, 26, and 29, at 5 p.m., by Prof. A. P. Brigham, of Colgate University, Hamilton, N.Y., the subject being "The United States, Regional and National." The lectures will illustrate the diversities and contrasts in the geological and human geography of the United States, and it will be shown how regionality has developed in spite of, and in some measure because of, such differences. Prof. Brigham is known as one of the most trusted and successful exponents of the "New Geography" in the United States, and we are sure that his lectures will be found both stimulating and instructive. The course is open to the public without charge.

Shackleton's Ship, the "Quest."

It is announced that the *Quest*, in which Sir Ernest Shackleton made his last voyage, has been sold to Norwegian buyers, and will once more be employed in the whaling and sealing industry, for which she was originally built.

OBITUARY

Lieut.-Colonel Henry Haversham Godwin-Austen.

ON December 2 there passed away from his peaceful retirement in the sweet Surrey hills the oldest member of the Royal Geographical Society, and one of its Gold Medallists, Colonel Godwin-Austen, pioneer, explorer, and geologist, the son of R. A. C. Godwin-Austen, F.R.S. (who was himself a distinguished geologist), of Shalford House, Surrey. Godwin-Austen's name carries us back to the days when the wide world was full of opportunities for the adventures of the practical geographer bent on reducing the topography of the blank white spaces in the map to scientific order and exact delineation. Nowhere was there better opportunity than in that wide-spread mountain wilderness which forms the hinterland of Kashmir, in which the name of Godwin-Austen seems likely to endure for good. Born in 1834, and contemporary with Lord Roberts in the days of his early training at Sandhurst, he eventually gained a commission in the 24th Foot, which claimed more than one of his family in its lists. His military service lasted about six years, during which he served in the Burmese Expedition of 1852 and in the Punjab. In 1857 he joined the Indian Survey Department, and was appointed to the Kashmir Survey under Montgomerie, where at once he entered on that career of scientific exploration which has made his name so famous. He fixed the position of many gigantic peaks in the far hinterland of Kashmir, one of which (entered as K_2 in his "angle book") now sometimes, though not officially, bears his name and is probably second only to Everest in the world's altitudes. He was also the first to record the existence of the most extensive system of glaciers yet known outside the Polar Regions—the Baltoro, on the Gilgit frontier. In 1863–64 he was attached to the unlucky Bhutan Mission under Eden, and he then proved to the scientific world that for purposes of geographical topography the plane-table (then practically unknown to British surveyors) was *par excellence* the best instrument devised in the hands of an expert topographer. Later he was busy amongst the then unknown peoples of the north-east frontier of India. But throughout his career his inherited love of geology was ever predominant. He

not only first sketched out the main geological features involved in the structure of the North-West Himalayas, but when stationed for a time in Dehra Dun, between the Siwaliks and the Himalayan foothills, he explored the palæontology of the Siwaliks, and undoubtedly started subsequent scientific investigations in that system of the very greatest interest and value. He seemed to live amongst the bones of an extinct fauna that must once have lived and grazed over a vast tract of northern India. He retired to live on the family estate, which unfortunately passed from him, and near by, in an old-world farmhouse not far from Shalford, overlooking one of the loveliest views in Surrey, I found him quite lately still as keen as ever on those scientific investigations which have made his name great in many learned societies, and which brought together a large number of leading scientific men to join at the old Salford church in honouring the last call of this most eminent geographer.

T. H. HOLDICH.

Chester W. Purington.

We regret that the victims of the great Japanese earthquake included Mr. Chester W. Purington, an American engineer who had joined the Society in 1918, and had done good work in various parts of the world as a specialist in economic geology. Born at Boston in 1871, he graduated at Harvard in 1893, was on the economic staff of the U.S. Geological Survey from 1894 to 1897, and in 1904 was employed by the Survey to report on alluvial mining in Alaska. During explorations on behalf of industrial companies, British and American, he visited Mexico, South America, and North-East Siberia, in which last he had been at work since 1918. His two children, with their governess, also lost their lives in the disaster.

MEETINGS: ROYAL GEOGRAPHICAL SOCIETY: SESSION 1923–1924

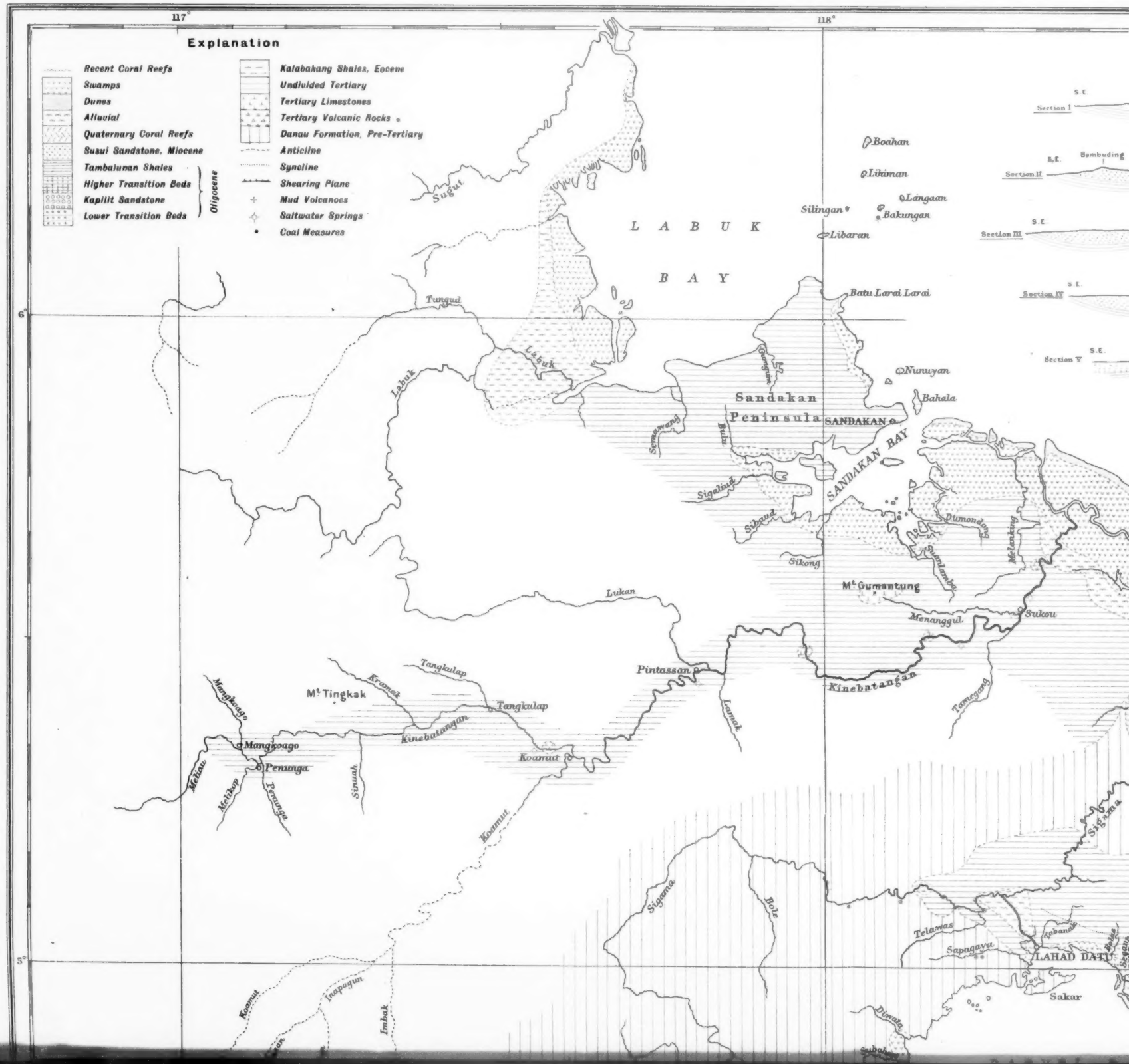
Fifth Evening Meeting, 14 January 1924.—The President in the Chair.

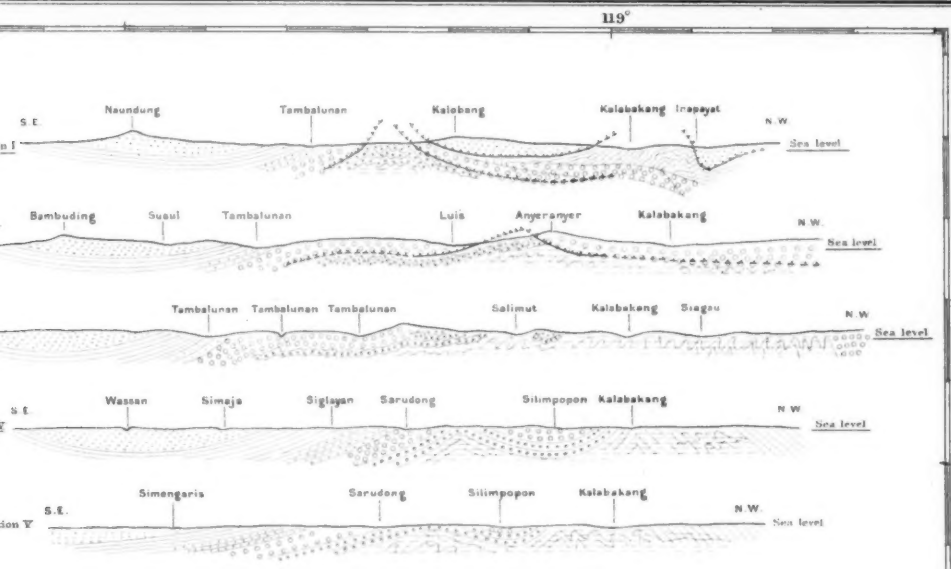
ELECTIONS.—Marcus Patrick Davis; Rudolf Dolge; Capt. James Duncan; Richard Playford Fenn, B.A., M.C.; John Thomas Gardiner; Malcolm Young Grant; William Lucas Handyside, M.A.; Harold Hodgson; Lieut. Robert Hillhouse Maclaren, R.E.; Rev. Roderick A. Macleod; Cecil Milsom Moore; Mrs. Roberta Isobel Moorsom; Tudor Yestin Price, M.A.; Dr. A. W. C. Scheidel, PH.D.; Edward Somerset; Alexander Stevens, M.A., B.SC.; Rev. Robert Lister Turner, M.A.; Major Eric Bolingbroke Walker, M.C., M.B.E.

PAPER: The Rocks and Monuments of Petra. Sir Alexander Kennedy.

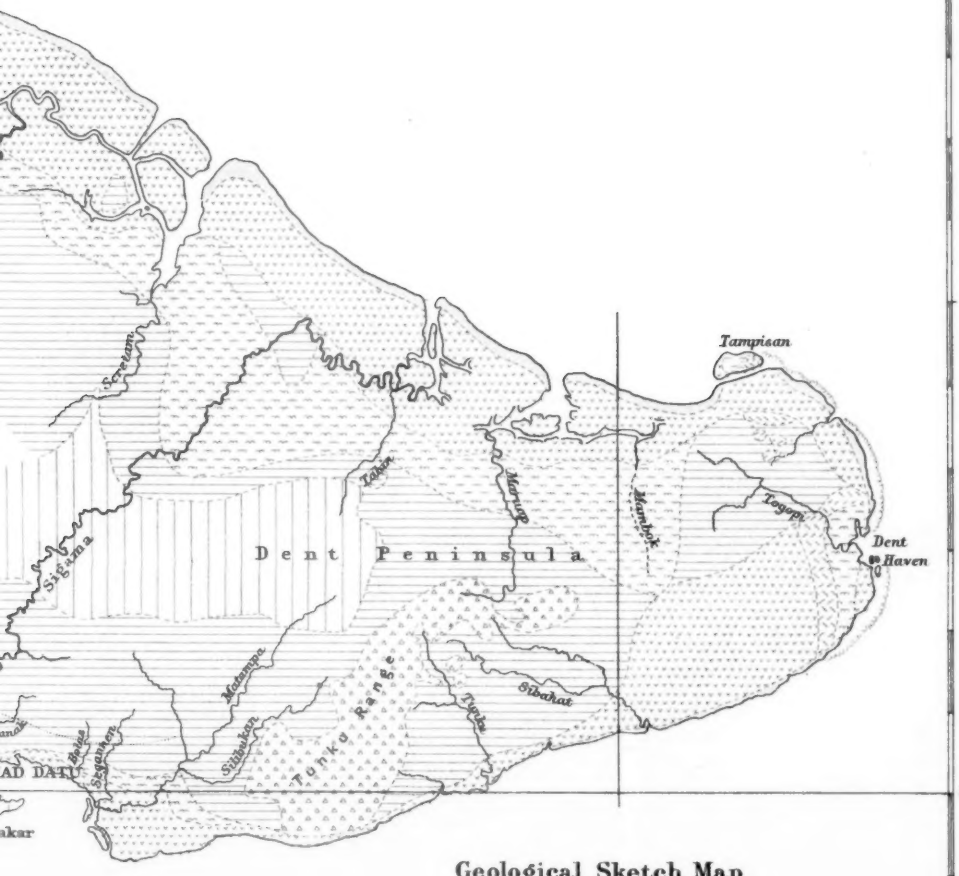
Third Afternoon Meeting, 21 January 1924.—The President in the Chair.

PAPER: Field Longitudes by Wireless. Capt. P. K. Boulnois.

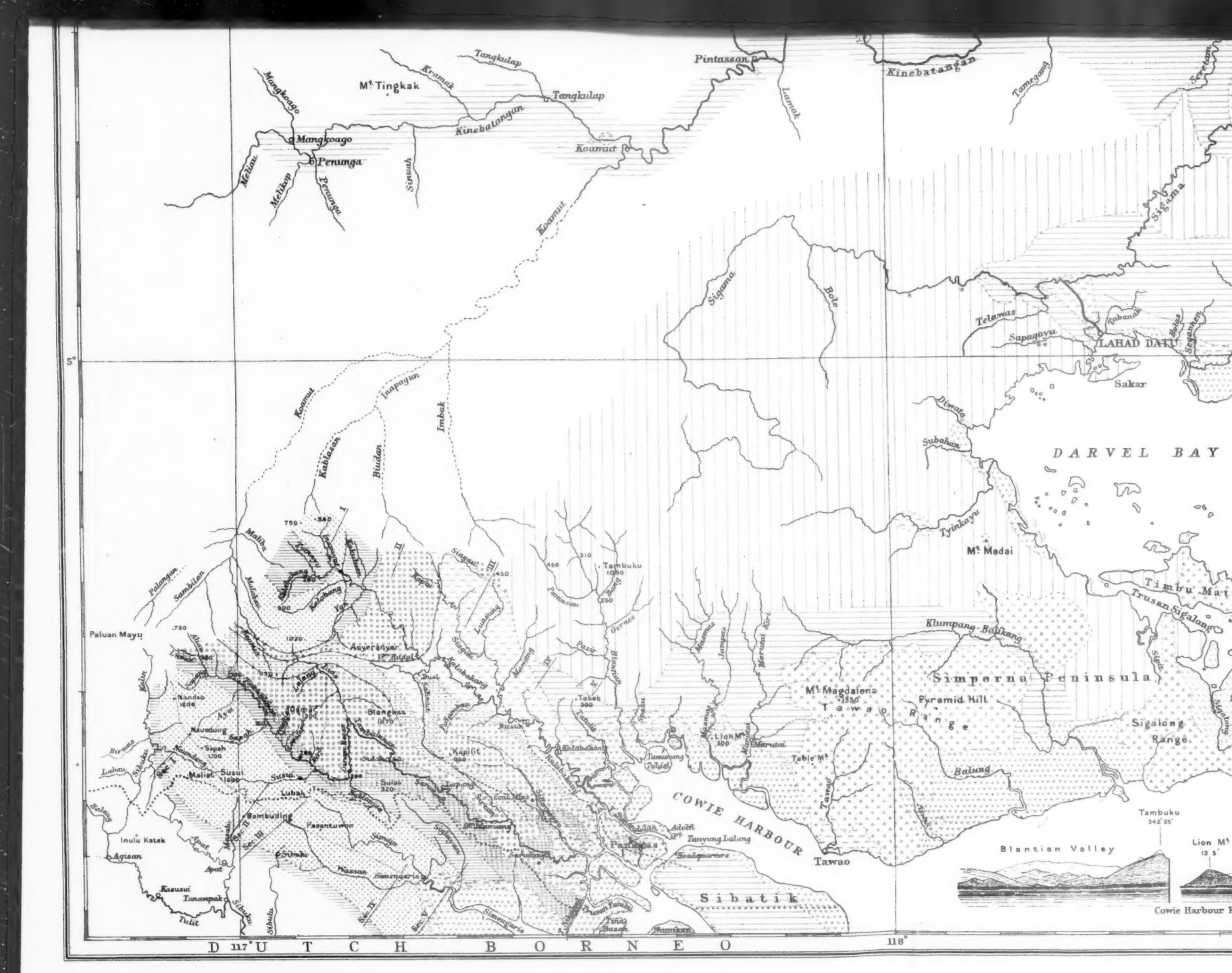

Explanation
Recent Coral Reefs
Swamps
Dunes
Alluvial
Quaternary Coral Reefs
Susui Sandstone, Miocene
Tambalunan Shales
Higher Transition Beds
Kapilit Sandstone
Lower Transition Beds
Oligocene
Kalabahang Shales, Eocene
Undivided Tertiary
Tertiary Limestones
Tertiary Volcanic Rocks
Danau Formation, Pre-Tertiary
Anticline
Syncline
Shearing Plane
Mud Volcanoes
Saltwater Springs
Coal Measures
117°
118°
6°
3°
LABUK BAY
Sugut
Tungud
Labuk
Batu Larai Larai
Boahan
Likiman
Langaan
Silingan
Bakungan
Libaran
Section I
Section II
Section III
Section IV
Section V
S.E.
Bambuding
Gungom
Nunuyan
Bahala
Sandakan Peninsula
SANDAKAN
SANDAKAN BAY
Sepanggang
Buta
Sigabud
Sibaud
Sikong
Dimondong
Suanlambai
Melanking
Mt. Gumantung
Lukan
Menanggul
Sukou
Pintassan
Kinebatangan
Tangkulap
Kramak
Mt. Tingkak
Mangkongo
Mangkoago
Penunga
Merkap
Sinuah
Kwamut
Lamak
Tamegang
Sigama
Bole
Telawas
Sapagaya
Tabanak
Bolee
Segama
LAHAD DATU
Sakar
Dimatas
Inapagun
Imbak
Cubak

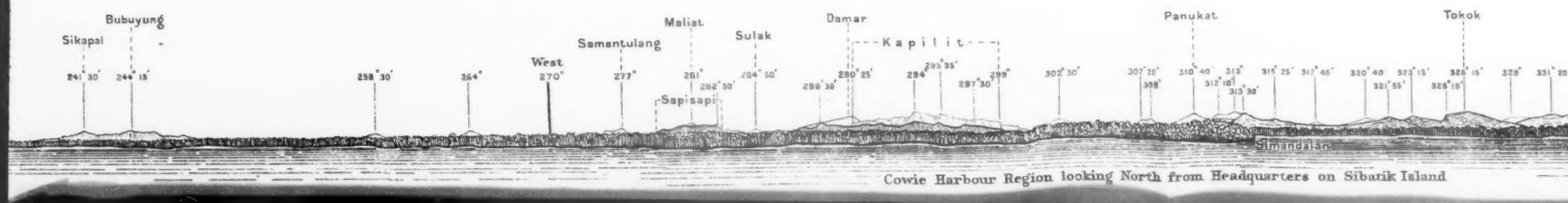


Geological cross sections through Cowie Harbour region
(See map for lines of sections)



Geological Sketch Map
of the
SOUTH EAST COAST





Cowie Harbour Region looking North from Headquarters on Sibatik Island

Dent Peninsula

Tunku Range

Dent Haven

BAY

Geological Sketch Map
of the
SOUTH EAST COAST
BRITISH NORTH BORNEO
by
MAX REINHARD

From surveys by M. Reinhard, K. Stamm, H. Jezler and F. Spiegelhalter
1913–14.

Scale 1/750,000 or 1 Inch = 11·83 Stat. Miles.

10 5 0 10 20

Heights in metres.

Simporna

Bum Bum

Lion M^t 13 8′

Mt Magdalena 45′

Table M^t 57′

owie Harbour Region looking North from Tanyung Lalang on Sibatik Island

119°

Tambuku

Lion M^t

North

Adolfi Point

Kwala Masmas